140-44

creative computing®

January 1982
vol 8, no 1
$2.50

Now Including
COMPUTERS AND PROGRAMMING

the #1 magazine of computer applications and software

Videodiscs

Using them with small computers

Survival: Moon Adventure Game

In-depth Evaluations:

- Castle Wolfenstein
- TRS-80 Invaders
- Eastern Front (Atari)
- Games for the VIC

Expanding Your TRS-80

Arcade Games: How to beat them

CCM12/01/1982481O6 18534 93075
SERIALS PROCESSING DEPT 1
UNIVERSITY MICROFILMS INT'L
300 N. ZEEB ROAD
ANN ARBOR MI 48106
01
0 76956 14044

THE COMMODORE COMPUTERS

"FROM $300 TO $1995, THEY COST LESS AND GIVE YOU MORE FOR YOUR MONEY. READ OUR CHART."

—William Shatner

The idea of a computer in every office and home used to be science fiction. Now it's becoming a reality. The question is, with so many to choose from, which computer should you buy? When you consider the facts, the clear choice is Commodore.

COMPARE OUR $995 COMPUTER

FEATURES	COMMODORE 4016	APPLE II	IBM
Base Price	**$995**	**$1,330**	**$1,565**
12" Green Screen	**Standard**	**299**	**345**
IEEE Interface	**Standard**	**300**	**NO**
TOTAL	**$995**	**$1,929**	**$1,910**
Upper & Lower Case Letters	**Standard**	**NO**	**Standard**
Separate Numeric Key Pad	**Standard**	**NO**	**Standard**
Intelligent Peripherals	**Standard**	**NO**	**NO**
Real Time Clock	**Standard**	**NO**	**NO**
Maximum 5½" Disk Capacity per Drive	**500K**	**143K**	**160K**

Prices are as of the most recent published price lists, September, 1981 and approximate the capabilities of the (16K) PET® 4016. Disk Drives and Printers are not included in prices. Models shown vary in their degree of expandability.

Many experts rate Commodore Computers as the best desk-top computers in their class. They provide more storage power—up to 1,000,000 characters on 5¼" dual disks—than any systems in their price range. Most come with a built-in green display screen. With comparable systems, the screen is an added expense. Our systems are more affordable. One reason: we make our own microprocessors. Many competitors use ours. And the compatibility of peripherals and basic programs lets you easily expand your system as your requirements grow. Which helps explain why Commodore is already the No. 1 desk-top computer in Europe with more than a quarter of a million computers sold worldwide.

COMMODORE
SOFTWARE
ENCYCLOPEDIA

WE WROTE THE BOOK ON SOFTWARE. The Commodore Software Encyclopedia is a comprehensive directory of over 500 programs for business, education, recreation and personal use. Pick up a copy at your local Commodore dealer.

FULL SERVICE, FULL SUPPORT. Commodore dealers throughout the country offer you prompt local service. In addition, our new national service contract with TRW provides nationwide support. Visit your Commodore dealer today for a hands-on demonstration.

Commodore Computer Systems
681 Moore Road
King of Prussia, PA 19406

Canadian Residents:
Commodore Computer Systems
3370 Pharmacy Avenue
Agincourt, Ontario, Canada, M1W 2K4

Please send me more information.

Name ____________________

Company____________ Title________

Address ____________________

City __________ State______ Zip______

Telephone____________________

Interest Area ____________________

☐ Business ☐ Education ☐ Personal CBM-CC

commodore
computer
commodore
Tractor Printer

commodore
COMPUTER

CIRCLE 120 ON READER SERVICE CARD

"My own IBM computer. Imagine that."

One nice thing about having your own IBM Personal Computer is that it's *yours*. For your business, your project, your department, your class, your family and, indeed, for yourself.

Of course, you might have thought owning a computer was too expensive. But now you can relax.

The IBM Personal Computer starts at less than $1,600† for a system that, with the addition of one simple device, hooks up to your home TV and uses your audio cassette recorder.

You might also have thought running a computer was too difficult. But you can relax again.

Getting started is easier than you might think, because IBM has structured the learning process for you. Our literature is in *your* language, not in "computerese." Our software *involves* you, the system *interacts* with you as if it was made to—and it was.

That's why you can be running programs in just one day. Maybe even writing your *own* programs in a matter of weeks.

For ease of use, flexibility and performance, no other personal computer offers as many advanced capabilities. (See the box.)

But what makes the IBM Personal Computer a truly useful tool are software programs selected by IBM's Personal Computer Software Publishing Department. You can have programs in business, professional, word processing, computer language, personal and entertainment categories.

You can see the system and the software in action at any ComputerLand® store or Sears Business Systems Center. Or try it out at one of our IBM Product Centers. The IBM Data Processing Division will serve those customers who want to purchase in quantity.

Your IBM Personal Computer. Once you start working with it, you'll discover more than the answers and solutions you seek: you'll discover that getting there is half the fun. Imagine that. IBM

IBM PERSONAL COMPUTER SPECIFICATIONS
*ADVANCED FEATURES FOR PERSONAL COMPUTERS

User Memory
16K - 256K bytes*
Permanent Memory
(ROM) 40K bytes*
Microprocessor
High speed, 8088*
Auxiliary Memory
2 optional internal diskette drives, 5¼", 160K bytes per diskette
Keyboard
83 keys, 6 ft. cord attaches to system unit*
10 function keys*
10-key numeric pad
Tactile feedback*

Display Screen
High-resolution (720h x 350v)*
80 characters x 25 lines
Upper and lower case
Green phosphor screen*
Diagnostics
Power-on self testing*
Parity checking*
Languages
BASIC, Pascal
Printer
Bidirectional*
80 characters/second
12 character styles, up to 132 characters/line*
9 x 9 character matrix*

Color/Graphics
Text mode:
16 colors*
256 characters and symbols in ROM*
Graphics mode:
4-color resolution: 320h x 200v*
Black & white resolution: 640h x 200v*
Simultaneous graphics & text capability*
Communications
RS-232-C interface
Asynchronous (start/stop) protocol
Up to 9600 bits per second

The IBM Personal Computer and me.

†This price applies to IBM Product Centers. Prices may vary at other stores.

For the IBM Personal Computer dealer nearest you, call (800) 447-4700. In Illinois, (800) 322-4400. In Alaska or Hawaii, (800) 447-0890.

Beam Aboard for Billions and Billions of Exciting Intergalactic Adventures...

GALAXY INVASION
A fleet of invading aliens has landed and you are the Earth's only hope. Can you protect our planet from these creatures? (With Sound!)

SUPER NOVA✲
Large and threatening asteroids and meteors are floating everywhere. Destroy them quickly or your ship will be disintegrated!

ATTACK FORCE
Your ship is being followed by Ramships that are loose in the quandrant. Be quick with your lasers or be crushed! (With Sound!)

METEOR MISSION 2
A huge explosion has occurred and many astronauts are trapped on a remote planet. Are you brave enough to rescue them? (With Sound!)

COSMIC FIGHTER
Your fuel level is low and you must refuel soon. Can you survive the alien's missile attacks before fuel runs out? (With Sound)

ROBOT ATTACK
Robots have overtaken a local space station. Fire your laser-pistol quickly because they are programmed to kill you! (With VOICE Sound)

BIG FIVE
SOFTWARE

P.O. Box 9078–185 · Van Nuys, CA 91409 · (213) 782-6861

CIRCLE 164 ON READER SERVICE CARD

Prices per Game:	TRS-80 16K Lev2 Mod1 / Mod3 Cassette—	$15.95
	TRS-80 32K Lev2 Mod1 / Mod3 Diskette—	$19.95
	Optional Joystick for Model 1—	$39.95

10% discount for 2 items, 15% for 3 or more.
Please add $1.75 per order for postage & handling, Calif. residents add 6% sales tax.
Outside USA (except Canada) please add $3.00 per order for postage & handling.

All Games © 1980, 1981 by Bill Hogue & Jeff Konyu.
Programs are written in machine language for high quality graphics & sou effects.
Voice & other sound effects are playable through the cassette AUX plug.
High scores are automatically saved after each game on disk versions.

Call or write for our complete catalog.
✲Audiovisual licensed from Atari.

s issue...in this issue...in this i

evaluations & profiles

34 **Invaders for the TRS-80** .... *Linzmayer*
Super Vaders and Space Intruders

38 **Escape From Castle Wolfenstein** .... *Brill*

41 **Profile of Ed Zaron** .... *Earle*
Real world programmer makes good

42 **Game Software for the VIC-20** .... *Lubar*

44 **Eastern Front** .... *Blank*
The Atari goes to war

Expanding the TRS-80 Model I

48 Exatron MM+ .... *Dyk*
50 LNW System Expansion .... *Zatarga*

56 **Aurora Systems Videodisc Controller** .... *Ahl*

58 **Adwar Video Proc Mod** .... *Ahl*
Videotaping from the Apple

articles

18 **Beating the Arcade Games** .... *Small & Small*
Asteroids, Battlezone, Galaxian, RipOff, Space Invaders

60 **Adventure in Videoland** .... *Lubar*
Rollercoaster: A computer/videodisc adventure

80 **The Rollercoaster Game Dissected** .... *Ahl*

84 **Visions of the Future** .... *Onosko*
Videodisc technology: current and future

98 **Videodiscs in the Classroom** .... *Kehrberg & Pollack*
An interactive economics course

104 **V is for Videodisc** .... *Kellner*
Using a Videodisc with Apple Super Pilot

106 **The First National Kidisc** .... *Blizek*
TV becomes a plaything

112 **Shopping for Videodiscs** .... *Ahl*
Smokey and the Bandit

118 **The New Tax Law** .... *Jacobs*
How will it affect computer owners?

the cover

William Oyler plays a hard game of Startovox at Leisureland Amusement of Morristown, NJ. See page 18 to learn how you can improve your score on five popular arcade games.

applications & software

122 **DSK Keyboard for the Apple** .... *Niesink*
Increase your typing speed

126 **Big Numbers and Small Computers** .... *Zimmerman*
A PET program to handle large numbers

142 **Survival** .... *Rush*
An adventure on the moon

departments

6 **Dateline: Tomorrow** .... *Ahl*
News and views

10 **Input/Output** .... *Readers*

14 **Editorial** .... *Ahl*
The magazine of the future

120 **Notices** .... *Fee*

154 **How to Solve It** .... *Piele*
Computer Problem Solving Contest

164 **IBM Images** .... *Fastie*
In which we discover how, where and why

172 **Software Legal Forum** .... *Novick*
More on Midway

176 **TRS-80 Strings** .... *Gray*
Graphics hints

182 **Intelligent Computer Games** .... *Levy*
Shogi

190 **Outpost: Atari** .... *Small & Small*
A Beginner's guide to character sets

210 **New Products** .... *Staples*

220 **Computer Store of the Month** .... *Gibbons*

224 **Index to Advertisers** ....

MEMBER
MITA

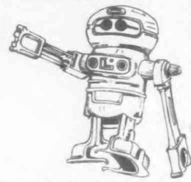
January, 1982
Volume 8, Number 1

Creative Computing (ISSN 0097-8140) is published monthly by Creative Computing, P.O. Box 789-M, Morristown, NJ 07960. Second Class postage paid at Lincoln, NE 68501.
Editorial offices located at 39 East Hanover Ave., Morris Plains, NJ 07950. Phone (201) 540-0445.
Domestic Subscriptions: 12 issues $20; 24 issues $37; 36 issues $53. Send subscription orders or change of address (P.O. Form 3575) to Creative Computing, P.O. Box 789-M, Morristown, NJ 07960. Call 800-631-8112 toll-free (in New Jersey call 201-540-0445) to order a subscription (to be charged only to a bank card).

Copyright©1981 by Creative Computing. All rights reserved. Reproduction prohibited.

Printed in USA.
Creative Computing is printed by Mid-America Webpress, Lincoln, NE 68501.

staff



Publisher/Editor-in-Chief	**David H. Ahl**
Editorial Director	**George Blank**
Editor	**Elizabeth Staples**
Associate Editor	**David Lubar**
Managing Editor	**Peter Fee**
Contributing Editors	**Dale Archibald** **Charles Carpenter** **Thomas W. Dwyer** **Stephen B. Gray** **Glenn Hart** **Stephen Kimmel** **Harold Novick** **Peter Payack** **Alvin Toffler** **C. Barry Townsend** **Gregory Yob** **Karl Zinn**
Editorial Assistant	**Andrew Brill**
Secretary	**Elizabeth Magin**
Production Manager	**Laura MacKenzie**
Art Director	**Sue Gendzwil**
Assistant Art Director	**Chris DeMilia**
Artists	**Diana Negri** **Candace Figueroa** **Carol Ann Henderson** **Eugene Bicknell**
Typesetters	**Jean Ann Vokoun** **Maureen Welsh**
Advertising Sales	**Rick Burdett** **Renee Fox Christman** **Jeff Horchler** **Renea Cole**
Marketing	**Laura Conboy**
Creative Computing Press Managing Editor	**Edward Stone**
Software Development	**William Kubeck** **Kerry Shetline** **Eric Wolcott** **Neil Radick**
Software Production	**Bill Rogalsky** **Rita Gerner** **Heather Everitt**
Operations Manager	**William L. Baumann**
Personnel & Finance	**Patricia Kennelly**
Bookkeeping	**Ethel Fisher**
Retail Marketing	**Jennifer Burr** **Laura Gibbons** **Roxanne Memmolo**
Circulation	**Frances Miskovich** **Dorothy Staples** **Moira Fenton** **Carol Vita** **Elsie Graff** **Brian Chamberlain** **Regina Jones** **Terri Murphy**
Office Assistants	**Rosemary Bender** **Linda McCatharn** **Diane Feller** **Mary McNeice** **Barbara Werry**
Order Processing	**Jim Zecchin** **Ralph Loveys** **Gail Harris** **Linda Blank** **Mark Smith** **Karen Brown** **Susan DeMark**
Shipping & Receiving	**Ronald Antonaccio** **Scott McLeod** **Nick Ninni** **Mark Archambault** **Mike Gribbon**

advertising sales

Advertising Coordinator
Renee Christman
Creative Computing
P.O. Box 789-M
Morristown, NJ 07960
(201) 540-0445

Western States
Jules E. Thompson, Inc.
1290 Howard Ave., Suite 303
Burlingame, CA 94010
(415) 348-8222
In Texas call (713) 731-2605

Southern California
Jules E. Thompson, Inc.
2560 Via Tejon
Palos Verdes Estates, CA 90274
(213) 378-8361

Mid-Atlantic, Northeast
CEL Associates, Inc.
27 Adams Street
Braintree, MA 02184
(617) 848-9306

Midwest
Ted Rickard
435 Locust Rd.
Wilmette, IL 60091
(312) 251-2541

New York Metropolitan Area
Nelson & Miller Associates, Inc.
55 Scenic Dr.
Hastings-on-Hudson, NY 10706
(914) 478-0491

Southeast
Paul McGinnis Co.
60 East 42nd St.
New York, NY 10017
(212) 490-1021

attention authors

Creative Computing will not be responsible for the return of unsolicited manuscripts, cassettes, floppy disks, program listings, etc. not submitted with a self-addressed, stamped envelope.

OK to reprint

Material in Creative Computing may be reprinted without permission by school and college publications, personal computing club newsletters, and nonprofit publications. Only original material may be reprinted; that is, you may not reprint a reprint. Also, each reprint must carry the following notice on the first page of the reprint in 7-point or larger type (you may cut out and use this notice if you wish):

Copyright © 1981 by Creative Computing, 39 E. Hanover Ave., Morris Plains, NJ 07950. Sample issue $2.50, 12-issue subscription $20.

Please send us two copies of any publication that carries reprinted material. Send to attention: David Ahl.

microform

Creative Computing is available on permanent record microfilm. For complete information contact University microfilms International, Dept. F.A., 300 North Zeeb Road, Ann Arbor, MI 48106 or 18 Bedford Road, London WC1R 4EJ, England.

foreign customers

Foreign subscribers in countries listed below may elect to subscribe with our local agents using local currency. Of course, subscriptions may also be entered directly to Creative Computing (USA) in U.S. dollars (bank draft or credit card). All foreign subscriptions must be prepaid.

Many foreign agents stock Creative Computing magazines, books, and software. However, please inquire directly to the agent before placing an order. Again, all Creative Computing products may be ordered direct from the USA—be sure to allow for foreign shipping and handling.

CANADA	**Surface**	**Air**
1-year	C $29	n/a
2-year	55	n/a
3-year	80	n/a

AUSTRALIA	**$A**	**$A**
1-year	28	52
2-year	54	101
3-year	78	150

ELECTRONIC CONCEPTS PTY., LTD.
Attn: Rudi Hoess
Ground Floor 55 Clarence St.
Sydney, NSW 2000, Australia

ENGLAND	**£**	**£**
1-year	15.00	30.00
2-year	30.00	54.00
3-year	45.00	80.00

CREATIVE COMPUTING
Attn: Hazel Gordon
27 Andrew Close
Stoke Golding, Nuneaton CV12 6EL

GERMANY	**dm**	**dm**
1-year	52	86
2-year	98	168
3-year	141	250

HOFACKER-VERLAG
Ing. W. Hofacker
8 Munchen 75
Postfach 437, West Germany

HOLLAND, BELGIUM		**f**
1-year		119
2-year		231
3-year		332

2XF COMPUTERCOLLECTIEF
Attn: F. de Vreeze
Amstel 312A
1017 AP AMSTERDAM, Holland

ITALY	**IL**	**IL**
1-year	34,000	52,000
2-year	53,000	72,000
3-year	72,000	87,500

ADVEICO S.R.L.
Via Emilia Ovest, 129
43016 San Pancrazio (Parma) Italy
Attn: Giulio Bertellini

JAPAN	**Y**	**Y**
1-year	6,900	11,800
2-year	13,300	23,100
3-year	19,300	34,400

ASCII PUBLISHING
Aoyama Building 5F
5-16-1 Minami Aoyama, Minato-Ku
Tokyo 107, Japan

PHILIPPINES	**P**	**P**
1-year	214	363
2-year	413	716
3-year	596	1059

INTEGRATED COMPUTER SYSTEMS, INC.
Suite 205, Limketkai Bldg., Ortigas Ave.
Greenhills P.O. Box 483, San Juan
Metro Manila 3113, Philippines

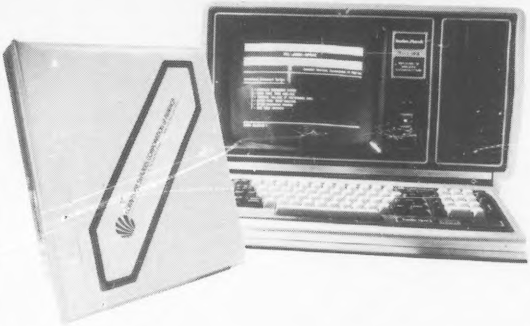
SWEDEN	**Kr**	**Kr**
1-year	123	206
2-year	236	405
3-year	340	603

HOBBY DATA
Attn: Jan Nilsson
Fack
S-200 12 Malmo 2, Sweden

OTHER COUNTRIES	**US$**	**US$**
1-year	29	50
2-year	55	97
3-year	88	143

CREATIVE COMPUTING
P.O. Box 789-M
Morristown, NJ 07960, USA

ANNOUNCING A REVOLUTION IN THE COST OF PROFESSIONAL SOFTWARE



VISACCOUNT is a fully integrated business and accounting system designed for use in small businesses. VISACCOUNT is extremely comprehensive and professional, yet it is very easy to use. The system is controlled from a series of interconnected menus permitting user-friendly operation. Everything you need to set-up and operate the system is provided with the VISACCOUNT package. Experts have estimated the development costs for a fully integrated software system ranges between $7,200 and $22,000.† When you buy software the developer has to recapture this expense. Computer Services Corporation of America is selling its software with a view that volume sales can almost negate this development cost.

OUR GUARANTEE — Buy both our software and that of our competitors (who will no doubt charge several times our price because they need to recapture their development cost). Compare the two systems and we know you'll return theirs (make sure they'll let you return their software). If you decide not to keep our system, then return it within 45 days for a full refund. Once you've used our system we're confident you'll be delighted.

†Microcomputers for Business: Applications 1979

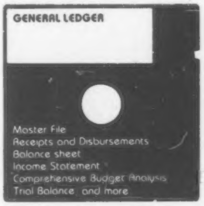
VISACCOUNT

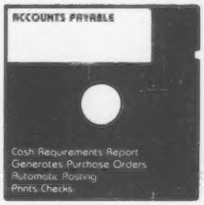
What You Receive

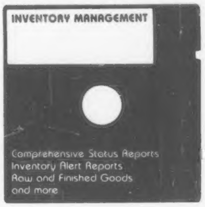
- Nine 5¼" double density disks (or six 8" single density disks)
- Easy-to-use operator's manual (over 200 pages)
- Self-study guide on bookkeeping and accounting (over 180 pages)
- Cassette based instruction program on set-up and operation

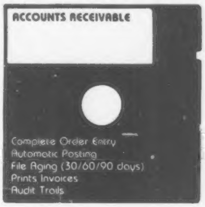
Available for Apple*, TRS-80, and most others

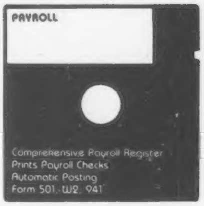
*The Apple version requires the Microsoft Z80 softcard.
CSCA has CBASIC2, CP/M and Microsoft Z80 softcard in stock.

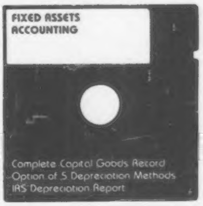

GENERAL LEDGER
Master File
Receipts and Disbursements
Balance sheet
Income Statement
Comprehensive Budget Analysis
Trial Balance and more


ACCOUNTS PAYABLE
Cash Requirements Report
Generates Purchase Orders
Automatic Posting
Prints Checks


INVENTORY MANAGEMENT
Comprehensive Status Reports
Inventory Alert Reports
Raw and Finished Goods
and more


ACCOUNTS RECEIVABLE
Complete Order Entry
Automatic Posting
File Aging (30/60/90 days)
Prints Invoices
Audit Trails


PAYROLL
Comprehensive Payroll Register
Prints Payroll Checks
Automatic Posting
Form 501, W2, 941


FIXED ASSETS ACCOUNTING
Complete Capital Goods Record
Option of 5 Depreciation Methods
IRS Depreciation Report

EXTRA: MAILING LIST PROGRAM

Features

Menu Driven: The entire system runs from a single master menu which accesses numerous subsidiary menus, when needed, to perform the full spectrum of business and accounting functions.

Self-Documenting: All the information needed to use the sytem is provided in an easy to self-study format.

Requirements: 48K CBASIC2
2 DISK DRIVES CP/M

©1981 Computer Services Corporation of America

Send $159 for the VISACCOUNT system

COMPUTER SERVICES CORPORATION of AMERICA
332 East 30th Street New York, New York 10016
Order Toll Free 1-800-221-2486
Technical Number 1-212-685-0090

Name ______________________________

Address ______________________________

City/State/Zip ______________________________

☐ Master Charge ☐ Visa ☐ American Express

No. ____________________ Expires ____________

Your System ______________________________

Disk Size ☐ 5¼" double density ☐ 8" single density

CIRCLE 127 ON READER SERVICE CARD

ow...dateline:tomorrow...da

David H. Ahl

BALLY ARCADE GAMES LICENSED TO COMMODORE FOR VIC 20

Bally has licensed Commodore to manufacture its arcade coin-op games in cartridges for the VIC-20 Computer. Retail prices will range from $24.95 to $39.95.

This is the second license agreement Bally has entered into recently, the other being with Atari for PacMan for use on Atari computers.

SEARS TO HANDLE NEC, IBM, VECTOR GRAPHIC

Sears acknowledged recently that it's retail computer stores will handle three lines of computers: the NEC PC-8000, IBM personal computer and Vector Graphics Series 3. This is a big boost for NEC whose internal squabbles between two competing divisions accompanied by on-again, off-again contracts confused and soured many independent retailers.

VIDEODISC MANUFACTURERS THEIR OWN WORST ENEMIES

Elsewhere in this issue, you'll find the first computer/videodisc game. It uses an Apple computer, Pioneer VP-1000 Laser Disc player and Aurora interface. You'd think Pioneer would be delighted to have a new form of software on the market to enhance the usefulness of their player.

Not so. John Talbot, Pioneer's marketing vice president won't speak to us, they refused to loan us a player for development and to show the game at the fall round of personal and home entertainment shows, and haven't responded to our offer to let them demonstrate the game at CES.

Not only that but attorneys at MCA feel the Screen Actors Guild contract prohibits the use of the movie discs for use with computer game software. Apparently a disc is sold only to be viewed straight through as a movie and not for any interactive use.

Do laserdiscs have a future? Technologically, yes. In the real world, not until Pioneer and the SAG take off their blinders.

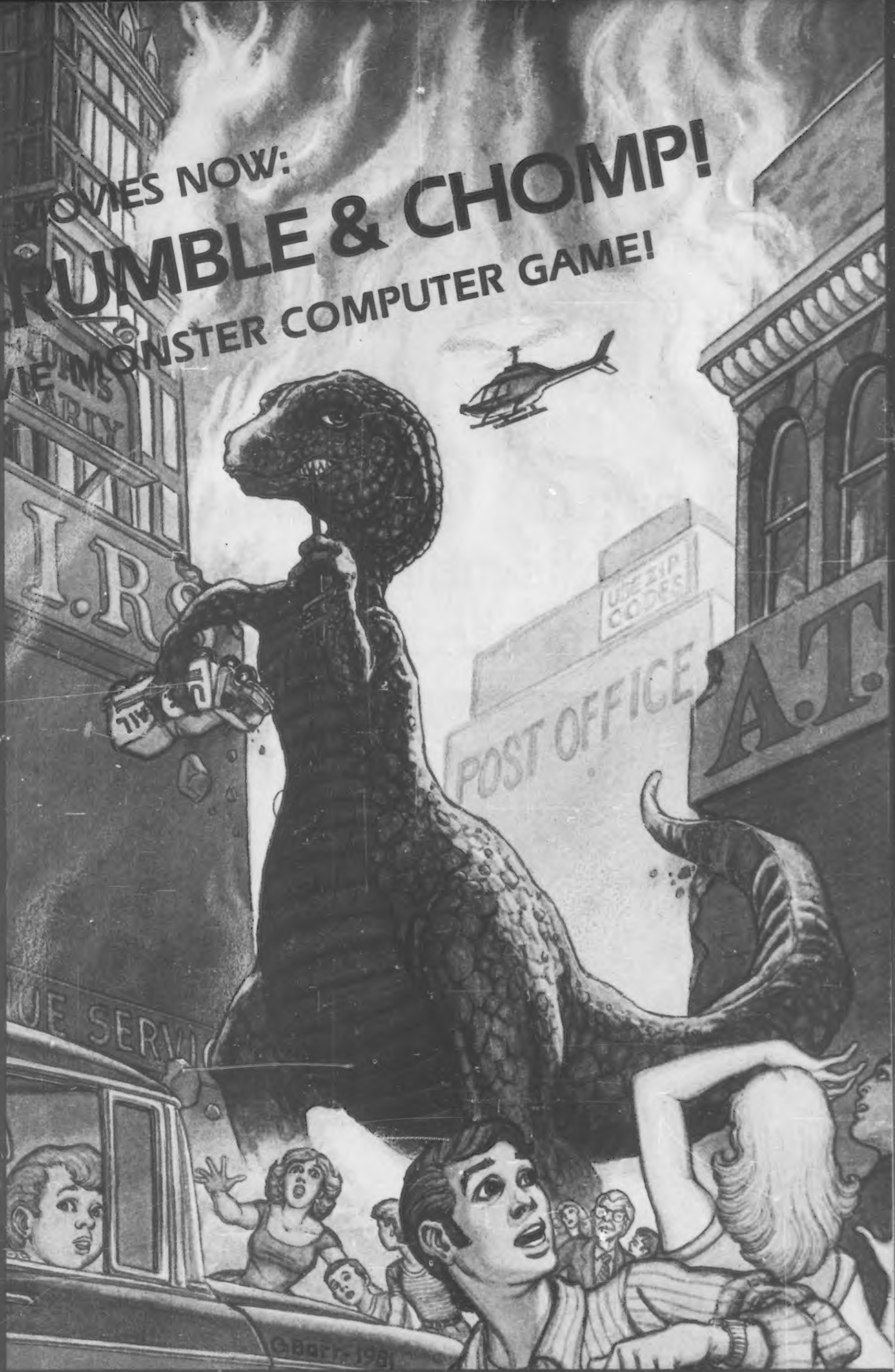
RCA VIDEODISC ALSO OFF TO SLOW START

RCA geared up to produce 500,000 SelectaVision videodisc players in 1981 but so far has sold only 40,000. At the present sales rate of 750 per week it is obvious that it has not caught the imagination of the consumer in any major way. Apparently most people just don't seem to understand what a videodisc is; nor do they see advantages of the disc compared to tape.

From our standpoint, the RCA system with its grooved disc and stylus has less to offer for computer interfacing than the laserdisc optical system although, as mentioned above, Pioneer is being anything but cooperataive.

CBS, AT&T EXPERIMENT WITH TELETEXT IN GARDEN STATE

Starting next fall 200 households in Ridgewood, NJ will be furnished with an "integrated data terminal" consisting of a color CRT and keyboard which will be able to access a wide array of services including news, sports, weather, entertainment and shopping. The data base material will be transmitted over NJ Bell lines from a host DEC PDP 11/70 computer. CBS will be producing most of the programmed material. The trial is slated to run for 7 months and will have more computer functions than the recently aborted Austin, Texas experiment.



FIRST: MONSTER MOVIES NOW:

CRUSH, CRUMBLE & CHOMP!

THE GREAT MOVIE MONSTER COMPUTER GAME!

And guess who stars as the movie monster. You! As any of six different monsters. More if you have the disk version.

You can terrorize and destroy four of the world's largest and most densely populated cities in over 100 possible scenarios. From Tokyo to the Golden Gate, you are the deadliest creature in the air, on the land, or in the sea.

You can be the deadly amphibian who simultaneously smashes street cars, lunches on helpless humans and radiates a ray of death.

If you were a giant winged creature, think of the aerial attacks you could make on the terrified but tasty tidbits beneath you.

But as in all the best monster movies, you're up against everything the human race can throw at you—even nuclear warheads and a strange concoction developed by a team of mad scientists.

For only $29.95 you get 6 stupendous monsters, each with its own monstrous summary card, 4 teeming metropoli displayed in graphic detail on your computer display and mapped in the accompanying 48-page illustrated book, the awesome sounds of monsterly mayhem, and spine-tingling, real-time, edge-of-your-seat excitement.

GET CRUSH, CRUMBLE & CHOMP
now at your local dealer for your APPLE, ATARI,
or TRS-80 . . **before it's too late.**

EPYX
COMPUTER GAMES THINKERS PLAY

CIRCLE 110 ON READER SERVICE CARD
]

Baked Apple.

Last Thanksgiving, a designer from Lynn/Ohio Corporation took one of the company's Apple Personal Computers home for the holidays.

While he was out eating turkey, it got baked.

His cat, perhaps miffed at being left alone, knocked over a lamp which started

a fire which, among other unpleasantries, melted his TV set all over his computer. He thought his goose was cooked.

But when he took the Apple to Cincinnati Computer Store, *mirabile dictu*, it still worked.

A new case and keyboard made it as good as new.

Nearly 1,000 Apple dealers have complete service centers that can quickly fix just about anything that might go wrong, no matter how bizarre.

So if you're looking for a personal computer that solves problems instead of creating them, look to your authorized Apple dealer.

You'll find everything well-done.

The personal computer. apple®

For the authorized dealer nearest you, call (800) 538-9696. In California, call (800) 662-9238. Or write: Apple Computer Inc., 10260 Bandley Dr., Cupertino, CA 95014.

CIRCLE 117 ON READER SERVICE CARD

put...input/output...in

Berlitz

Dear Editor:

The July 1981 issue of *Creative Computing* contains a letter from David Gross commenting on the problems of translating between Basic dialects. As I have just translated the program in question, "Streets of the City" *Creative Computing*, April 1981), from the TRS-80 Basic to Applesoft, perhaps I can help with this problem and also point out some problems in the published program listing.

The most important rule in translating any program is that you must understand the intent of the original code. "Streets of the City" is written in an extended Microsoft Basic and uses only a few features unique to the TRS-80 version.

These features relate primarily to the TRS-80 screen format and character set. The screen is organized as 16 lines of 64 characters each, and may include mixed text and graphics characters. The text characters are the standard 7-bit ASCII character set. These are augmented by 64 graphics characters with ASCII code values of 128 to 191 and which are listed in several recent reviews of printers that come equipped to print them, such as the Epson MX-80; and by 64 "space-compression codes" with ASCII code values of 192 to 255. Each of the latter will produce N-192 spaces, where N is the ASCII code value of the character being printed. In "Streets of the City" they are used to "clear to the end of line."

TRS-80 Basics include a PRINT AT (Level I) or PRINT @ (Level II) statement to allow both horizontal and vertical tabbing on the screen. Each possible screen position is indexed from 0 (zero, upper left) to 1023 (lower right) such that positions 0 to 63 form the top line, positions 64 to 127 the second line, and so on.

This statement causes scrolling on line 16 unless the text printed is followed by a semi-colon. In translating from the TRS-80 version to Applesoft, the main difficulty was to convert from a 64 by 16 format to the Apple's 40 by 24 format.

The only other special function used is RND(N). In TRS-80 Basics it returns a random integer between 0 and N if N > = 1. The Applesoft equivalent is to DEF FNR(N)=INT((N+1)* RND(1) and replace RND(N) with FNR(N) in the rest of the program.

The absence of a directory to explain the meaning of the variables proved more of a problem than the translation itself.

In addition, I uncovered the following problems in the listing. The fixes suggested here should be TRS-80 compatible; they must be translated to other Basics.

Replacement: 3065 IF YR = 1 GOTO 3241

Delete: 3071,3072 (they duplicate lines 3052 and 3053)

Replacement: 3295 IF S2(1) > 0 THEN S6 = ... (rest of line ok; eliminates redundant conditional)

Replacement: 3385 IF T(5,YR) < T(5,0) THEN B3 = T(5,YR)-2 ELSE B3 = T(5,0)-2(original had B2 = ...in ELSE clause).

Replacement: 3655 IF CV < 6 THEN 15496 (original refers to non-existent line).

Replacement: 3700 PRINT "PROPERTY TAX NEEDED";... (rest ok; values are in dollars, not mills)

Replacement: 3784 IF X>2 THEN IF X<=CV THEN X3=RND(5) ELSE X3=RND(8) (original has unreachable code)

Replacement: 3801 IF X1>6 THEN 3805 ELSE IF TB(2,YR) ... (rest ok; original lacks ELSE and second IF is unreachable).

Replacement: 10627 IF PC<2 THEN 10630 ELSE IF LS>=... (same problem as 3801)

Renumber: 15177 BECOMES 15240 (printer went beserk?)

Ungarble: 15180 by deleting all text after "THEN 15190" (as above).

There are many other places where the program can be made more efficient by simplifying expressions and removing parentheses.

Finally, assuming these problems have been corrected in the version sold by Creative Computing Software, let me note that the time it took to translate, enter and debug this program was probably worth about twice the cost of the disk-based version I could have ordered. I suspect this is generally true of any lengthy program.

The only value in doing the translation is to learn new Basic "tricks of the trade." Although "Streets of the City" is an excellent simulation that I can wholeheartedly recommend (I still haven't mastered it!), the code is commendably straightforward, so that this task will be of little value to all but the beginning programmer, who will find the lack of a data directory especially frustrating when trying to understand the internals of this simulation.

Paul DeBenedictis
306 Kensington Place
Syracuse, NY 13210

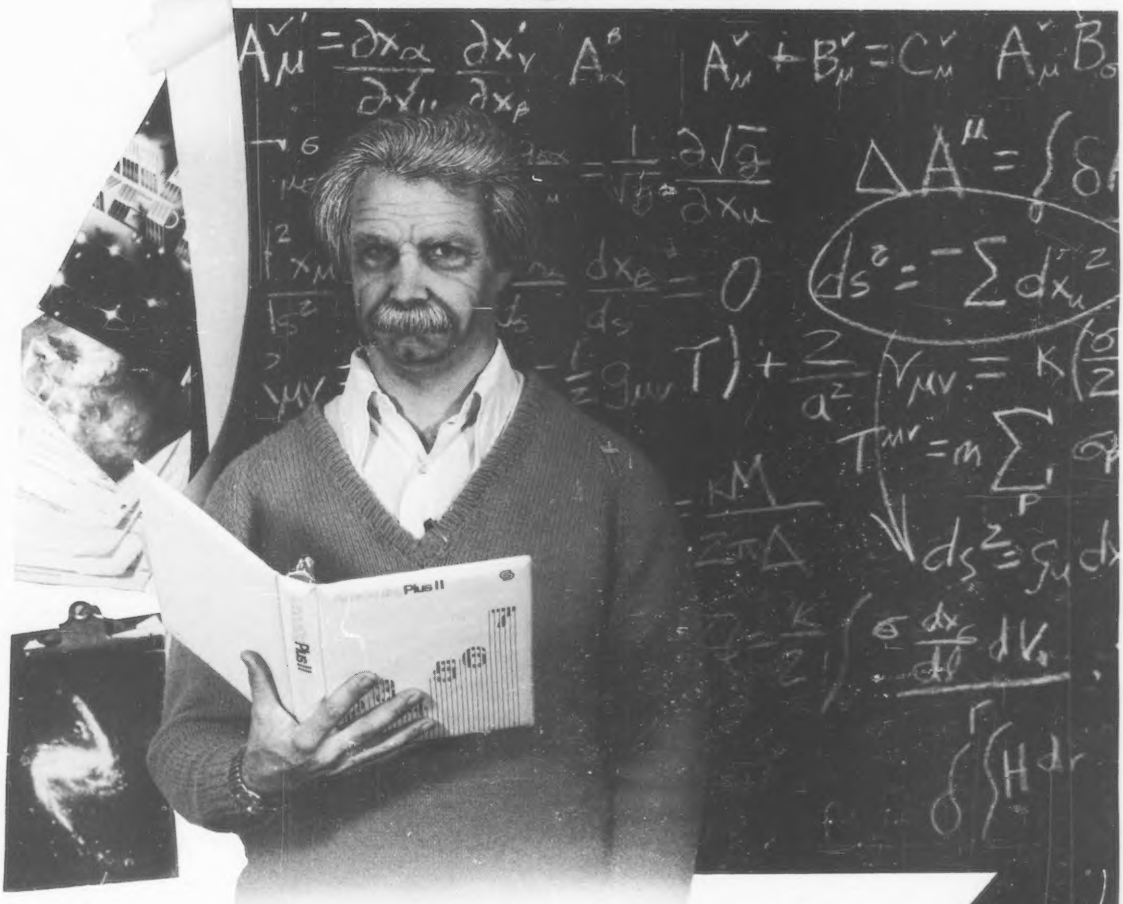
Traveller's Checks

Dear Editor:

Congratulations on another great issue of *Creative Computing* (August 1981). Although Lloyd Johnson's simulation "Star Merchant" is an enjoyable game, I thought it would only be fair, to the readers and the source, to mention the source of the simulation.

"Star Merchant" is based on the science fiction role-playing system "Traveller." I first became aware of the connection after examining the cargoes and their base prices. I am disappointed by Mr. Johnson's negligence in crediting "Traveller" as his source.

Accounting Plus II It Figures



It figures that the same people who brought you Accounting Plus* on the larger computer systems wouldn't forget the Apple.** Accounting Plus II brings to the Apple Computer a completely integrated, easy to use accounting system. Accounting Plus II doesn't require any special hardware, only 48K of RAM and two floppy drives or hard disk, and you don't have to be a CPA to use it. Accounting Plus II organizes and streamlines your paper flow and generates checks, invoices, statements and purchase orders on pre-printed forms. The system supports a solid audit trail which your business requires and your accountant demands.

Modules now available:

- General Ledger
- Accounts Receivable
- Accounts Payable
- Inventory with purchasing

For additional information call or write
Systems Plus Inc., 3975 East Bayshore,
Palo Alto, CA 94303 Phone 415/969/7047

Seeing is believing.

Systems Plus

*TM of Software Dimensions, San Jose, CA
**TM of Apple Computers, Cupertino, CA

CIRCLE 277 ON READER SERVICE CARD

"Traveller" is a role-playing system set in the far future (57th century A.D.) in a vast empire, The Imperium, containing approximately 11,000 worlds. The rules cover many facets of life in The Imperium and are constantly being expanded.

"Traveller" is available from hobby stores or from Game Designers' Workshop, Box 1646, Bloomington, IL 61701. The basic set is $11.98 (US) and *Book O: An Introduction to Traveller* for $5.98 (US) is an excellent introduction to the "Traveller" universe for the beginner.

Marc Schlichtman
82 Highland Ave.
St. Catharines
Ontario, Canada
L2R 4J2

Thanks for the information. We, too, regret the oversight.—EBS

Freeze Your Boots Off

Dear Editor:

I am an occasionally proud and satisfied TRS-80 Model I owner. When the system is working, there is none better for the money. But when it's not, it's a prime source of frustration and anger.

As I understand from many other TRS-80 users my ailment is a very common one and it should just be "lived with." The problem/symptom I'm referring to is when the screen "freezes" or less frequently the "random reboot." I have read of a few fixes for these two problems (most center around poor electrical connections at the parallel port connections) and tried most, but none work reliably.

Can you help me with this problem? I would like to know what exactly is causing these symptoms/problems and how the hardware can be fixed permanently.

I have faith that your experience and knowledge with these matters will save me. Please don't let me down.

Ronald W. Graham, Jr.
Graham Marine Electronics
12 Rogers St.
Gloucester, MA 01930

This is a continuing problem, which we have not solved. In fact, it is the main reason that we have been converting to the LNW-80 computer for some of our in-house computing. It has yet to show the problem, while our Model I's and III's do lock up. As you mentioned, cleaning the contacts between the keyboard and expansion interface helps. Radio Shack went through a series of modifications including a buffered cable and a direct refresh circuit connection in an attempt to solve this, so if you have one of the earliest model I's, you may be able to get some help at your repair center.

*Instead of fixing the problem, I rely on saving the information. If you are using TRS-DOS 2.3, NewDOS, LDOS, or DOS-Plus, and running a Basic program, you should be able to recover your program with BASIC *. See the instructions in your manual.*

If you are using Scripsit, press the RESET key and hold down ENTER to override any AUTO message until you return to DOS READY. Then type DEBUG and press ENTER. Next press BREAK to enter the DEBUG monitor. Now type G6008 and press ENTER to return to SCRIPSIT with your file intact.

In desperate situations, I use RSM 2D from Small Systems Software. Their diskette comes with a short BOOT routine that does not disturb resident memory. I load the monitor into the top of memory and use the ASCII dump function to find my program or data. If I just want a copy, I print it at the printer.

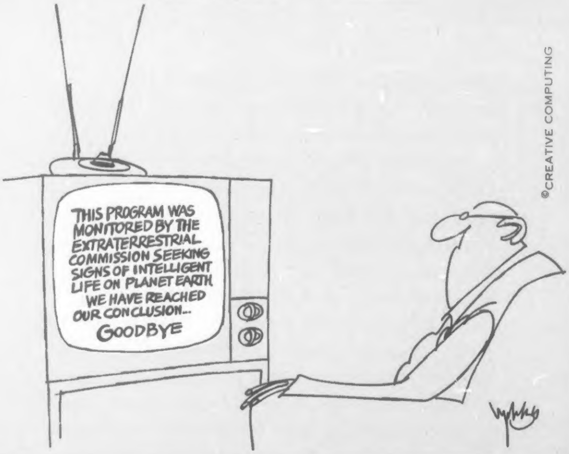
If I want to recover my typing efforts, I note the starting and ending locations, convert them to decimal addresses, then return to Basic with one file and protect memory where my material begins.

If the ending address is greater than memory location 32767, you must subtract the ending address from 65536 to get the address in a form that Basic can understand. Then I use this program, with the appropriate starting and ending values substituted for 26810 and -32176, to recover my material.

```
10 OPEN "O",1,"RECOVER/TXT"
20 FORM = 26810 TO 32767:PRINT #1, CHR$(PEEK(M));
   :NEXT
30 FORM = 32768 TO -32176:PRINT #1,CHR$(PEEK(M));
   :NEXT
40 CLOSE
```

This saves your material in a sequential disk file called RECOVER/TXT.

Please do not call me for help on these methods. I regret that my duties make it impossible for me to coach people over the phone. Therefore, I suggest that you practice the methods before you need them with dummy data, so that you can feel confident when you do have a crash. LDOS has special functions to deal with these problems that you might also wish to consider.—GB


THIS PROGRAM WAS MONITORED BY THE EXTRATERRESTRIAL COMMISSION SEEKING SIGNS OF INTELLIGENT LIFE ON PLANET EARTH. WE HAVE REACHED OUR CONCLUSION... GOODBYE

©CREATIVE COMPUTING

Low cost software with high priced quality

When we tell you that our super-sophisticated software package gives you top quality at rock-bottom prices, we're not fooling. It lets you handle large files easily, you get a powerful command set that takes you through every phase of document production clearly and simply, and because our software package lends itself to customization, you're able to modify the presentation to meet your specific requirements.

EVERY TYPIST AN EXPERT

Because our MINCE TEXT EDITOR gives you a full screen image of the text being edited before you print it, you will be able to insert, delete, move entire blocks of text and more . . . all at the touch of a key or two! What you see on the screen is what you get. Period!

TEXT FORMATTER ENHANCEMENT

Our SCRIBBLE FORMATTER lets you think in terms of the actual structure of the document so you can handle chapters, sections, subsections, verses, quotations, and the like *automatically* while typing. No longer will you have to worry about remembering margins, vertical spacing, etc. . . . they're handled automatically too.

OUR COMPETITION IS RED

And they should be. After all, they can't offer all of the super features and quality that our package can at our unbeatably low prices. It's just another way for us to show you that . . . the Mark of The Unicorn is your mark of quality at a reasonable price.

VERY LOW COST

MINCE and SCRIBBLE are priced at $175.00 each or buy both of them for only $275.00. Available from Westico, Lifeboat, Cornerstore or direct from us.

Rising above the competition

Mark of the Unicorn

P.O. Box 423
Arlington, MA 02174
(617) 489-1387

CIRCLE 152 ON READER SERVICE CARD

Magazines of The FUTURE

David H. Ahl

It's going to be different than many people are forecasting. Despite a tremendous growth in electronic media, I just don't see all the newspapers, magazines, and other printed materials going out of business any time soon. The printed word has been with us for a long time and is remarkably resilient. I don't believe that just because people can contact databases and manipulate facts and figures on a TV screen that these electronic goodies will replace curling up in a chair with an interesting magazine or a good book.

I also believe a substantial number of people, perhaps the majority, would prefer to get things in the mail rather than over the telephone. The motive for this is primarily financial. Having worked for Ma Bell and having been exposed to their desired future directions, it seems to me that the Bell System will be moving as fast as possible toward usage-sensitive pricing. That is, one will pay for the amount of time and distance one uses. There will be no such things as local calling areas or flat rates. Naturally consumers will protest this movement, but in the long run that is the direction that the Bell System is going. Their determination is reinforced by the fact that more and more competitors are active in the areas of equipment and terminal gear and, as a result, the Bell System has to look to network use as their main source of revenue in the future.

Consequently, although today the cost of telecommunications is rising less rapidly than the cost of the US mail or parcel delivery services and the gap between the two is getting narrower, I believe that the gap will begin to widen again in the future.

I also believe from a psychological standpoint that many people, again perhaps the majority, would prefer to do things at their own pace, time, and place. For example, although some people enjoy "timed" games, many people do not. Or, in reading a novel, many people prefer to read a chapter each night before bed while others will sit down and read it straight through. This suggests that services that are geared to the telephone (or other communications service) that force people to be in a particular place for a particular amount of time (as short as possible if you are paying for connect time) and complete everything in one burst may not be welcomed by the majority of the population.

What all this suggests to me is that there may be a good opportunity to provide an alternative to the all-electronic media, in particular, a data base retrieval system that retains the advantages of the printed media. It doesn't take a genius to realize that at the moment this alternative is computer software in the form of floppy disks and tape cassettes, but the speed and capacity of these media are rather limited. The third alternative, of course, is the ROM cartridge as used in the Atari video computer system, Texas Instruments computer and others. However, this is excessively costly and certainly not viable for fast turnaround or short runs of an item. Obviously with double density and two-sided floppy disks, the amount of information that one of them can hold increases. However, if one is looking at a database the size of, let's say, one day's worth of New York Stock Exchange listings (two newspaper pages) this would take several, if not scores, of floppy disks. Furthermore the medium is almost completely useless if we want to intermix moving color pictures, i.e., television quality pictures, along with computer information.

Hence, the medium that I think offers the most promise, because it requires the least additional technology, is the laser scan video disk. At the moment, optical video disks and their players are relativey expensive. However, there are two developments on the horizon that lead me to believe that the costs will be coming down dramatically in the near future. The first one is the 4-1/2" all-digital audio disk recently announced by Philips and for which at least four manufacturers have indicated that they will be producing a player. The second development is another all-digital audio "disk" the size of a credit card which has been developed by Dr. Thomas Stockham and for which he is currently developing a player. In general, the target price for audio components is under $300 and once some of the majors move in, there is usually a flurry of 'Chinese copies' so that the devices can usually be had for $100 or less.

What this suggests to me is that there may be a substantial financial opportunity for a company to take the technology which is being developed for the audio field and apply it to the computer field. Like so many other products, the real opportunity is not with the hardware but with the software. Like Gillette, the only reason to sell razor handles is to sell the blades. So the real opportunity I see is for an array of special subscription services offering financial data, coin collection data, engineering data, astronomy data, and all the different things for which people are currently subscribing to special-interest magazines as well as broad-based data retrieval services such as The Source and MicroNet.

Personally I believe this is a much more viable and economically feasible form of "electronic publishing" than that currently being tested by AT&T with their "electronic yellow pages," the Knight-Ritter newspaper tests in Florida, and even The Source, MicroNet, and other general services.

In summary, the device I see being offered is a very inexpensive interface between an RS-232 port and as many of the all-digital audio players as possible. "Electronic magazines" could then be offered for the many special interest areas mentioned above plus others. There are some neat things about this strategy. One, piracy would be practically non-existent since the equipment to duplicate a laser scan disc is rather costly. Two, it's not particularly threatening to the existing printed media (who have strenuously resisted most of the on-the-air electronic experiments) or to the electronic media as it currently exists. Consequently, while the media may not cooperate with a new firm, at least they will not be down right hostile.

Disadvantages: One, it will probably fail, and two, on the way to failing it will cost a bundle. *--DHA*

PALANTIR
TM

Don't make your computer old before its time

Now there's Palantir™ — Word Processing and Accounting Software for Today's Computers

You've just gotten a brand new computer. Don't tie it down with old software. Two-year-old software will make it run like a two-year-old computer.

The microcomputer industry is the fastest growing, most exciting industry in the world. Today's printers, terminals and disk drives can do things no one even dreamed of two years ago.

But a computer is just a dumb piece of metal until software gives it life, and, unfortunately, microcomputer software has not kept up with the hardware.

Until now.

There's a commonly held belief that you should not buy new software because it hasn't been tested. We say, *"Hogwash!"*

At one time those complaints might have been valid, but the software industry has come of age. We do our testing *before* we release a product, not afterwards.

More importantly, we've learned that quality cannot be *tested* into a product; it must be *built* in from the beginning by people who know what they are doing.

And we do.

We formed Designer Software because we believed that the quality hardware of today demanded software of equal quality. It took a lot of time, sweat, money, care, experience and talent to make that belief a reality.

We set high standards, but our team of CPA's, systems analysts, programmers, writers, artists and marketers that created *Palantir*™ Word Processing and Accounting have exceeded all of our expectations.

Palantir™ is the most professional packaged software ever to be offered to the CP/M® market.

We don't expect to convince you of that with just one ad, and we won't try. But if you're in the market for business software, we hope we've convinced you to find out more about *Palantir*™ — today's software for today's computers.

Designer Software™
HOUSTON

For more information and the name of a dealer near you, please write, call, telex or use The Source. Dealer, distributor and OEM inquiries invited.

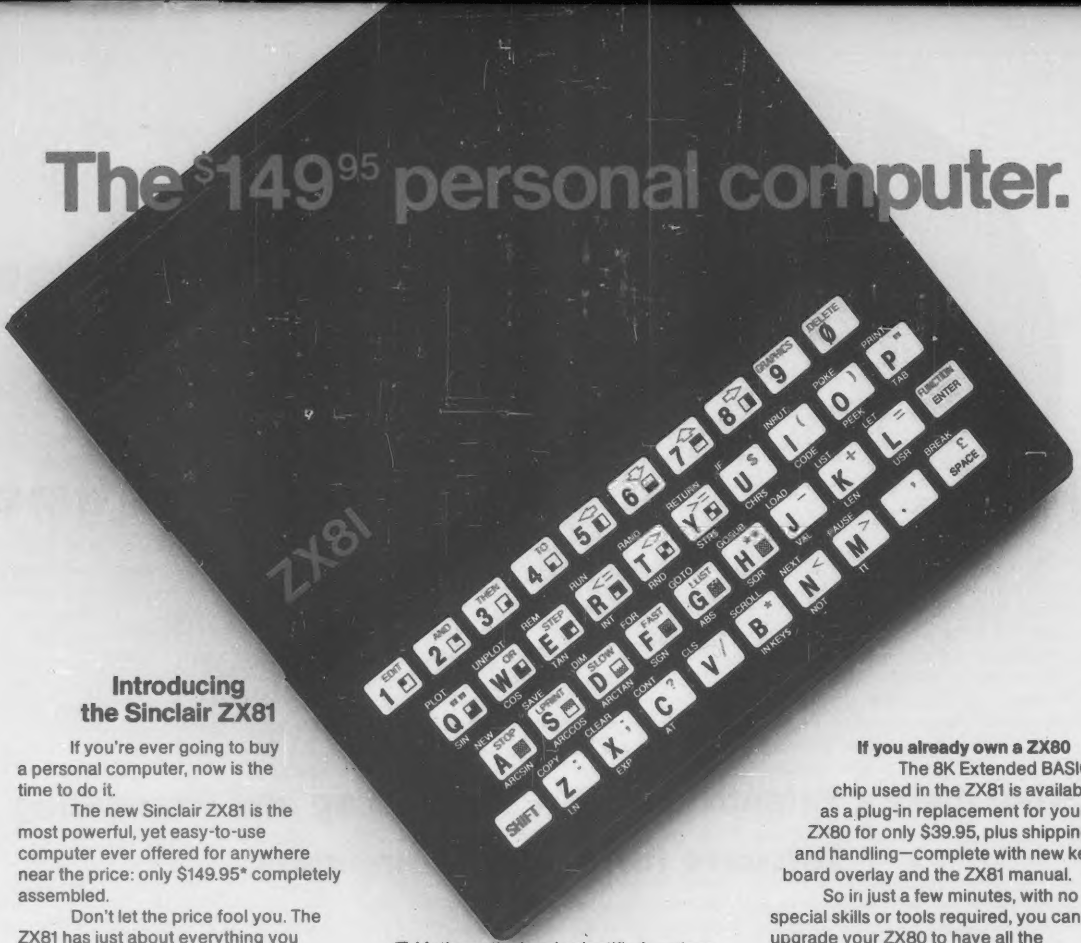
3400 Montrose Blvd. • Suite 718 • Houston, Texas 77006
(713) 520-8221 • Telex 790510 • Source TCU671

CP/M is a registered trademark of Digital Research.

CIRCLE 150 ON READER SERVICE CARD

Designer Software and Palantir are trademarks of Palantir, Inc.

The ${}^{\$}149^{95}$ personal computer.



Introducing the Sinclair ZX81

If you're ever going to buy a personal computer, now is the time to do it.

The new Sinclair ZX81 is the most powerful, yet easy-to-use computer ever offered for anywhere near the price: only $149.95* completely assembled.

Don't let the price fool you. The ZX81 has just about everything you could ask for in a personal computer.

A breakthrough in personal computers

The ZX81 is a major advance over the original Sinclair ZX80—the world's largest selling personal computer and the first for under $200.

In fact, the ZX81's new 8K Extended BASIC offers features found only on computers costing two or three times as much.

Just look at what you get:

- Continuous display, including moving graphics
- Multi-dimensional string and numerical arrays
- Mathematical and scientific functions accurate to 8 decimal places
- Unique one-touch entry of key words like PRINT, RUN and LIST
- Automatic syntax error detection and easy editing
- Randomize function useful for both games and serious applications
- Built-in interface for ZX Printer
- 1K of memory expandable to 16K

The ZX81 is also very convenient to use. It hooks up to any television set to produce a clear 32-column by 24-line display. And you can use a regular cassette recorder to store and recall programs by name.

If you already own a ZX80

The 8K Extended BASIC chip used in the ZX81 is available as a plug-in replacement for your ZX80 for only $39.95, plus shipping and handling—complete with new keyboard overlay and the ZX81 manual.

So in just a few minutes, with no special skills or tools required, you can upgrade your ZX80 to have all the powerful features of the ZX81. (You'll have everything except continuous display, but you can still use the PAUSE and SCROLL commands to get moving graphics.)

With the 8K BASIC chip, your ZX80 will also be equipped to use the ZX Printer and Sinclair software.

Warranty and Service Program**

The Sinclair ZX81 is covered by a 10-day money-back guarantee and a limited 90-day warranty that includes free parts and labor through our national service-by-mail facilities.

*Plus shipping and handling. Price includes connectors for TV and cassette, AC adaptor, and FREE manual.

**Does not apply to ZX81 kits.

NEW SOFTWARE: Sinclair has published pre-recorded programs on cassettes for your ZX81, or ZX80 with 8K BASIC. We're constantly coming out with new programs, so we'll send you our latest software catalog with your computer.

ZX PRINTER: The Sinclair ZX Printer will work with your ZX81, or ZX80 with 8K BASIC. It will be available in the near future and will cost less than $100.

16K MEMORY MODULE: Like any powerful, full fledged computer, the ZX81 is expandable. Sinclair's 16K memory module plugs right onto the back of your ZX81 (or ZX80, with or without 8K BASIC). Cost is $99.95, plus shipping and handling.

ZX81 MANUAL: The ZX81 comes with a comprehensive 164-page programming guide and operating manual designed for both beginners and experienced computer users. A $10.95 value, it's yours free with the ZX81.

The $99.95 personal computer.

ZX81
sinclair

Introducing the ZX81 kit

If you really want to save money, and you enjoy building electronic kits, you can order the ZX81 in kit form for the incredible price of just $99.95.* It's the same, full-featured computer, only you put it together yourself. We'll send complete, easy-to-follow instructions on how you can assemble your ZX81 in just a few hours. All you have to supply is the soldering iron.

How to order

Sinclair Research is the world's largest manufacturer of personal computers.

The ZX81 represents the latest technology in microelectronics, and it picks up right where the ZX80 left off. Thousands are selling every week.

We urge you to place your order for the new ZX81 today. The sooner you order, the sooner you can start enjoying your own computer.

To order, simply call our toll free number, and use your MasterCard or VISA.

To order by mail, please use the coupon. And send your check or money order. We regret that we cannot accept purchase orders or C.O.D.'s.

CALL 800-543-3000. Ask for operator #509. In Ohio call 800-582-1364. In Canada call 513-729-4300. Ask for operator #509. Phones open 24 hours a day, 7 days a week. Have your MasterCard or VISA ready.

These numbers are for orders only. For information, you must write to Sinclair Research Ltd., One Sinclair Plaza, Nashua, NH 03061.

sinclair

AD CODE 01CC	PRICE†	QTY.	AMOUNT
ZX81	$149.95		
ZX81 Kit	99.95		
8K BASIC chip (for ZX80)	39.95		
16K Memory Module (for ZX81 or ZX80)	99.95		
Shipping and Handling	4.95		$4.95
To ship outside USA add $10.00			
		TOTAL	

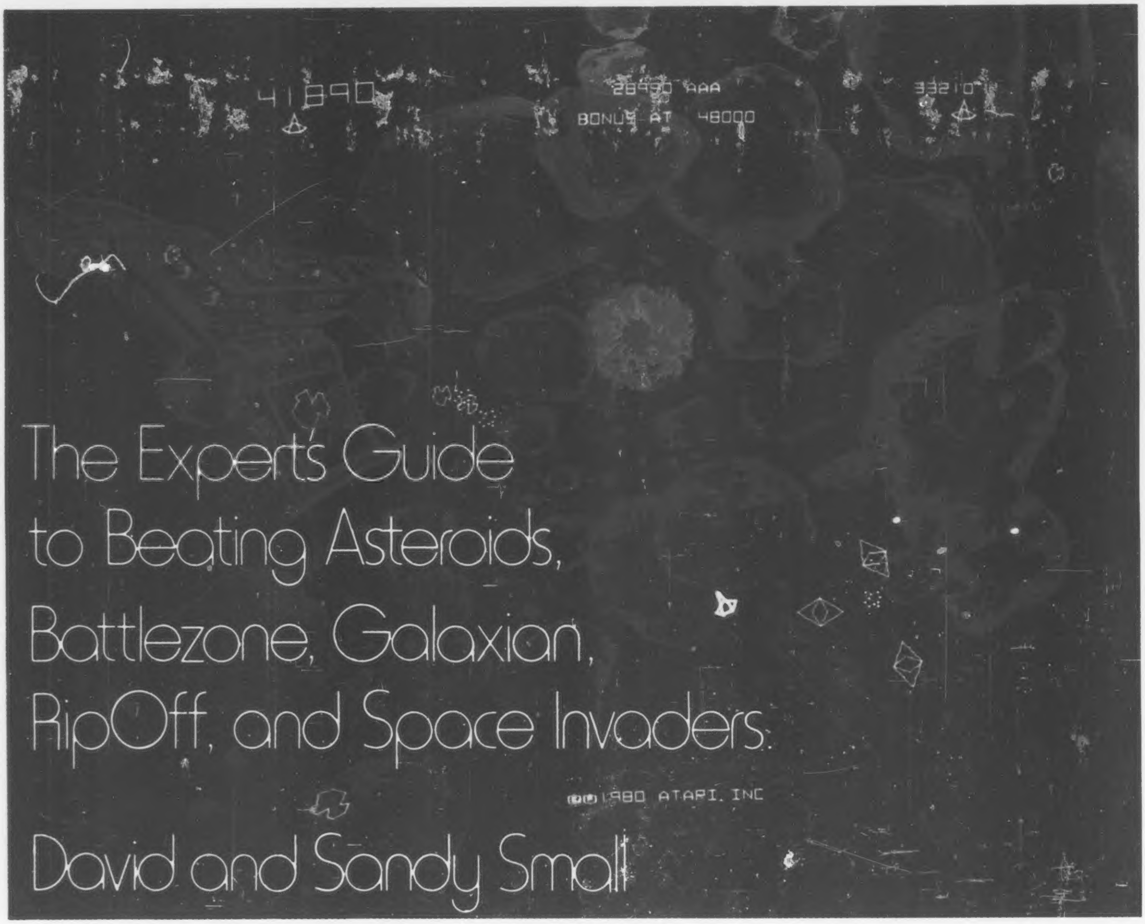
MAIL TO: Sinclair Research Ltd., One Sinclair Plaza, Nashua, NH 03061.

NAME ____________________

ADDRESS ____________________

CITY/STATE/ZIP ____________________

† U.S. Dollars



The Expert's Guide to Beating Asteroids, Battlezone, Galaxian, RipOff, and Space Invaders

David and Sandy Small

Yup, I'm addicted.

I spend my loose change and spare hours in the depths of depravity: coin-op video games. I play them, pound on them, and above all pour money into them. A roll of quarters and a game room are my idea of heaven. Sound familiar?

These games were costing me so much, and beating me so quickly, that I couldn't play them as often as I wanted. So in self defense I decided I'd better get good at playing them. This article describes the techniques I've developed over time and several thousand quarters. It isn't written as an introduction to these games, just as articles on machine language aren't meant for beginning programmers.

This article is meant for those of you who can't sleep without at least one game of Asteroids under your belt daily. It's for you with Space Invader's Wrist (you know, that ache after you've been holding your hand that funny way for three hours). It's for those with Battlezone Tunnel Vision, which makes you drive strangely during rush hour. (How many people aim themselves at cars in front of them and press the lights button, saying "Take that, Supertank?") In short, it's for players who already know how to play the games, but need some tips on how to beat them.

Don't expect any of these techniques I'll mention to be easy!

Some of them require a great deal of practice, but the rewards are great. The first is stretching your roll of quarters considerably. The second is the feeling of intense satisfaction you get from beating a machine that was designed to be nearly unbeatable. The third, and perhaps most satisfying, is the looks on the faces of people walking through the arcades when they see your score. Finally, no one is more popular than a game master, since everyone would like to learn how to beat the machines. It's a great way to meet people.

Let's start with Space Invaders, and find out how to achieve insanely high scores with it.

Space Invaders

Space Invaders, as everyone knows, took the world by storm. In Japan it became a craze of such magnitude that the mint had to triple production of the coin used in the machine. Things have cooled down a bit since then, but it's still a popular game, and a great way to improve your reflexes.

The method used to beat it is twofold. The first part involves the beginning two or three "ranks," or complete screenfuls of invaders. The second is for ranks beyond this.

At the start of the game, the enemy ships are well up there so there's little hurry. Move to the right side of the screen and pick them off one column at a time. (You may have to repeat fire a bit as enemy torps collide with yours, of course, but you want to finish a complete column

---

David and Sandy Small, 11314 Yucca Drive, Austin, TX 78750.

Make the Most of Your ZX81 or 80

SYNC Magazine

SYNC, a bi-monthly magazine for users and prospective users of the Sinclair ZX80 computer has expanded its coverage to include the ZX81 as well.

Now entering its second year, **SYNC** has been providing nearly 10,000 Sinclair computer owners with information on how to make most effective use of their computers. "Resources," one of the most popular sections of the magazine, has listed over 100 second source vendors of software, peripherals and books as well as user groups.

Each issue of the magazine carries complete application programs, tips and techniques for more effective programming, hardware modifications and in-depth evaluations of software, peripherals and books.

Subscriptions to **SYNC** cost $10.00 per year (6 issues). **SYNC**, 39 E. Hanover Ave., Morris Plains, NJ 07950. (201) 540-0445.

The ZX81 Companion

The ZX81 Companion by Bob Maunder follows the same format as the popular **ZX80 Companion**. The book assists ZX81 users in four application areas: graphics, information retrieval, education and games. The book includes scores of fully documented listings of short routines as well as complete programs. For the serious user, the book also includes a disassembled listing of the ZX81 ROM Monitor.

MUSE reviewed the book and said, "Bob Maunder's **ZX80 Companion** was rightly recognized to be one of the best books published on progressive use of Sinclair's first micro. This is likely to gain a similar reputation. In its 130 pages, his attempt to show meaningful uses of the machine is brilliantly successful."

"The book has four sections with the author exploring in turn interactive graphics (gaming), information retrieval, educational computing, and the ZX81 monitor. In each case the exploration is thoughtfully written, detailed, and illustrated with meaningful programs. The educational section is the same—Bob Maunder is a teacher—and here we find sensible ideas tips, warnings and programs too."

Softbound, 5 1/2 x 8", 132 pages, $8.95.

The Gateway Guide to the ZX81 and ZX80

The Gateway Guide to the ZX81 and ZX80 by Mark Charlton contains more than 70 fully documented and explained programs for the ZX81 (or 8K ZX80). The book is a "doing book," rather than a reading one and the author encourages the reader to try things out as he goes. The book starts at a low level and assumes the ZX80 or ZX81 is the reader's first computer. However by the end, the reader will have become quite proficient.

The majority of programs in the books were written deliberately to make them easily convertible from machine to machine (ZX81, 4K ZX80 or 1K ZX80) so no matter which you have, you'll find many programs which you can run right away.

The book describes each function and statement in turn, illustrates it in a demonstration routine or program and then combines it with previously discussed material.

Softbound, 5 1/2 x 8", 172 pages, $8.95.

Getting Acquainted With Your ZX81

This book is aimed at helping the newcomer make most effective use of his ZX81. As you work your way through it, your program library will grow (more than 70 programs) along with your understanding of Basic.

The book is chock full of games such as *Checkers* which draws the entire board on the screen. Other games include Alien Imploders, Blastermind, Moon Lander, Breakout, Digital Clock, Roller-Ball, Derby Day, and Star Burst.

But the book is not all games. It describes the use of PLOT and UNPLOT, SCROLL, arrays, TAB, PRINT AT, INKEYS, random numbers and PEEK and POKE. You'll find programs to print cascading sine waves, tables and graphs; to solve quadratic equations; to sort data; to compute interest and much more.

Softbound, 5 1/2 x 8", 120 pages $8.95.

Order Today

To order any of these books, send payment plus $2.00 shipping and handling per order to Creative Computing Press at the address below. Visa, MasterCard and American Express orders should include card number and expiration date. Charge card orders may be called in toll-free to the number below.

creative computing

39 E. Hanover Avenue
Morris Plains, NJ 07950

Toll-free 800-631-8112
In NJ 201-540-0445

CIRCLE 215 ON READER SERVICE CARD

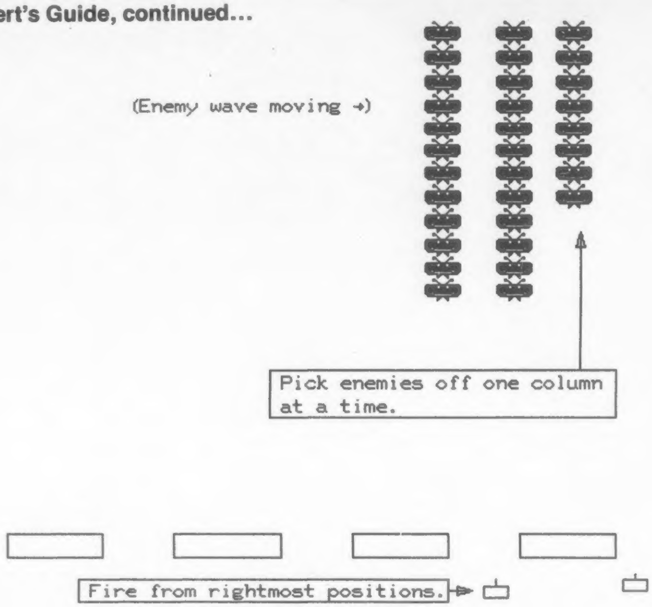
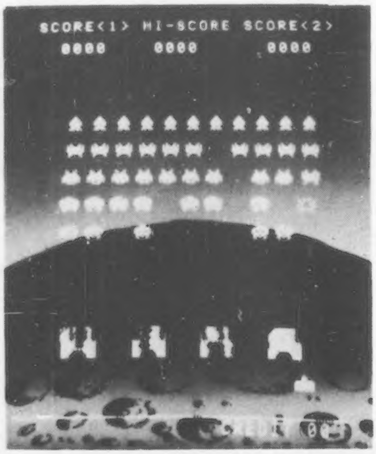

(Enemy wave moving →)
Pick enemies off one column at a time.
Fire from rightmost positions.

Figure 1.

There is a "gap" between the bottom of the invader and the spot where the missile is first plotted, and, more importantly, where collisions between the missile and your base are first checked for.

at a time.) Try to destroy columns from the extreme right hand side of the screen working left, but if a column is out of range or hidden behind a barrier, take whoever is handiest. See Figure 1.

The key here is that the invaders must complete a full left-right or right-left sweep before advancing a row down. If you destroy a full column of them, it takes more time for them to complete a sweep and thus slows the advance. With enough time, you'll then be able to destroy them all.



Note: The possibility of an invader firing at you is greatest if you are below him. You'll notice that enemy fire tends to concentrate on you; this is why. If you move a lot, this can be used to your advantage, as the only enemy fire you will have to worry about is random and of less heavy concentration.

To zap the space ship as it goes over, left to right, move your base to the extreme right. Fire when he passes under the "O" of "Score" for Player 2. You'll hit him every time. You can figure something similar out for the other side.

When there's only one invader left, he moves pretty quickly. More importantly, he's likely to be close. Every time he passes over your position, he'll fire at you and you'll have little time to react. So sit near a barrier and fire at him, then immediately start moving once you've fired and get under the barrier. Don't wait for his shot.

It's after you've taken out two or three ranks that the fun really begins. There just isn't enough time to use the above techniques any more, so we have to rely on a bug in the Invaders program.

This bug has to do with where an invader missile appears when first fired. Briefly, there's a "gap" between the bottom of the invader and the spot where the missile is first plotted, and, more importantly, where collisions between the missile and your base are first checked for. This is the way to get really amazing scores with Invaders—especially if you don't have superhuman reflexes.

When the invaders get all the way down to the last row they can be on before winning on the final one, they are very close to your base. In fact, they're so close that the "missile gap" means they won't be able to hit you; it starts plotting below your position and misses. This is useful. See Figure 2.

My technique is as follows: on each new rank past three, when things are really getting busy, I move one column in from the left side and blast a column completely through the invaders. I then expand it to two columns very carefully to the right side of the one just shot through. This gives a "safe area" in which to hide when the barriers are obliterated, which happens quickly on these ranks. Next, I try to do the same on the other side. This gives a hiding spot on either end. Remember you must leave at least one invader on the extreme ends to maintain the safe area at all times. See Figure 2.

I then sit in the safe area taking potshots at the spaceships flying overhead. When the invaders reach the final row, it's time

SPACE INVADERS

NEW...FOR APPLE II(1)

FROM PROMETHEUS

VERSAcard

1. Serial Input/Output Interface
2. Parallel Output Interface
3. Precision Clock/Calendar
4. BSR Control

NEW
4 in 1
CARD

ALL ON ONE CARD
with true simultaneous operation
. . .at a down-to-earth price!

CHECK THESE FEATURES: True simultaneous operation! VERSAcard's unique hardware selection circuitry make your Apple "think" that separate cards are installed. This allows VERSAcard interface ports to be compatible with existing software such as APPLE PASCAL, Microsoft Softcard(2), and most other Apple software.

The Serial Input/Output port is RS-232C standard with crystal controlled baud rates from 19.2K to 110 baud. You can connect with a CRT terminal, line printer, or virtually any RS-232 modem. VERSAcard's "Terminal" mode, along with a modem, connects you with the *Source* or a variety of other computers. "Terminal" mode also allows you to output to both printer and display simultaneously.

The versatile **Parallel Output Interface** is configured for the Centronics standard and is easily configured for other standards. Simply hookup your **Epson, Okidata, IDS**, or other printer and begin printing.

Precision Clock/Calendar. With all standard real-time clock/calendar functions and one second resolution. Battery back-up supplied. And, best of all, it's **software compatible with Thunderclock.** This makes numerous other software packages immediately usable. Interrupts are supported.

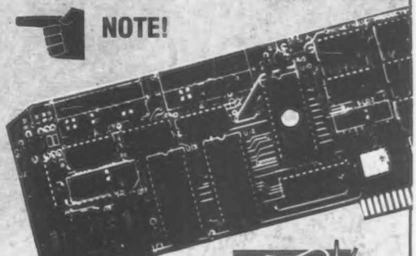
BSR Control. Add an ultrasonic transducer, and VERSAcard provides you with remote control through your BSR X-10 Home Control System.

Onboard firmware provides optional auto line feed, video, paging, terminal mode, lower to upper case, 8th bit set or clear . . . and more. These versatile device drivers permit connection to virtually any standard peripheral. The Prometheus engineering staff is available to help. With any peripheral and special device interface problems. Call us, we'd like to hear from you.

Order: PP-VCD-1 VERSAcard @ $249.00 each.

Compare Key Features	VERSAcard	CPS MultiFunction Card
Parallel, Serial and Realtime Clock Interfaces?	YES	YES
BSR Control Interface?	YES	NO
Compatible w/ Apple Pascal?	YES	NO. Special Pascal disk required.
Compatible with CP/M?	YES	NO. Special CP/M disk required.
Cable Included?	YES. One cable of choice free with each order —through 1981.	NO. Must be purchased separately.
Apple Modification?	NO	YES

NOTE!



Dealer inquiries invited.

VERSAcard—the only Apple peripheral card you're likely ever to need!

All Prometheus boards are completely tested and burned-in prior to shipment. A one-year warranty covers parts and labor.

Registered Trade Marks: (1) Apple Computers, Inc. (2) Microsoft Consumer Products

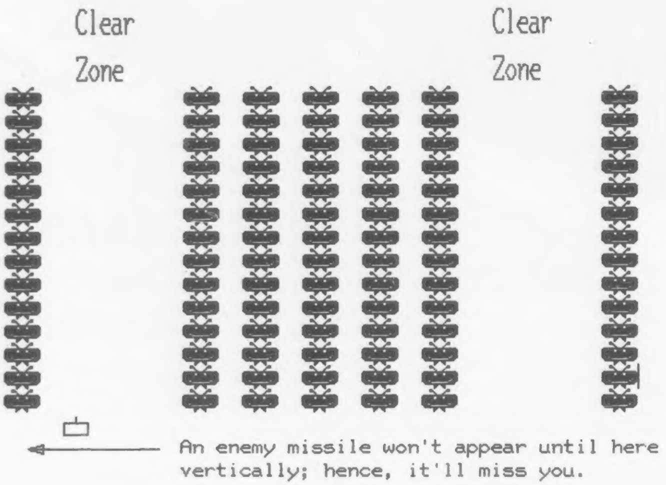
PROMETHEUS

PROMETHEUS PRODUCTS INCORPORATED

42577 Fremont Blvd. • Fremont, CA 94538 • (415) 490-2370

CIRCLE 282 ON READER SERVICE CARD

Enemy ships will have "eaten through" barriers and be on bottom row before winning. Stay in "clear zones" until then. When they reach the bottom row, their shots will always miss; move from one side to the other, against the enemy's direction flow, and pick off the bottom zone.



An enemy missile won't appear until here vertically; hence, it'll miss you.

Figure 2.

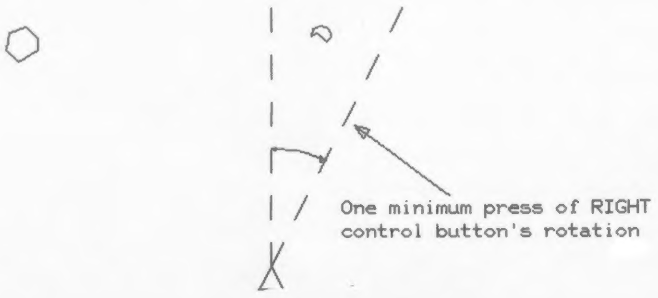
to eliminate the bottom row. Moving against the flow of the invaders, I blow up the bottom row one at a time. There's no great hurry, so be careful; move right under them and make the shot count. You can't be shot as long as the bottom man exists. When you zap him, go to the next one quickly, as the invader above him will open up at close range, and it's best to be on your way.

Work your way completely across. After destroying the invader on the far end, move into the other safe zone. Wait for them to move down another row, zap that row, etc. The last row gets a little hairy as the invaders really accelerate; for the last one, I'd recommend moving along with his horizontal motion to lessen the difference in speed between your ships.

If you find they're moving too fast anyway, you'll need to destroy a few columns to increase the amount of time you have on the final row.

After a bit of practice and fine tuning, you'll find yourself destroying endless ranks. You'll learn at what score the invaders flip over and you may even want to try counting your shots to increase the score for the space ships.

Figure 3.



One minimum press of RIGHT control button's rotation

The asteroid cannot be hit from the present ship location; it lies between the minimum increments of the ship's rotation.

Next, let's look at Asteroids, currently second in popularity only to Invaders.

Asteroids

Asteroids is not an easy game. It takes a great deal of practice to win even using the advice I'm about to give. You'll have to know such things as the speed of your missile nearly instinctively, so dig into your pocket and learn.

Perhaps the neatest thing about Asteroids is that it is endlessly playable. There is no limit to the number of ships you can win. This means that if you get a score of a million, you'll have a hundred extra ships (you get one for each 10,000 points). You can play until your arms turn blue and fall off. This is a rarity among video games; usually only one extra ship can be won.

Here are a few hints to note while learning. First, turning your ship is *not* a smooth motion. In other words, there is a limited number of positions in which your ship can appear while rotating, but there is a large difference in angle between minimum increments. The result is that from a non-moving position there are many places you can't hit, no matter how carefully you jockey your ship. What invariably kills the people who don't move is that an asteroid comes at them from an angle at which they can't fire. See Figure 3.

The solution is to move! If you're moving, you fire a spread of torpedoes which can sweep an area, versus just a straight line of them. Get used to moving around; you'll need to be good at it. Become especially familiar with going offscreen and note where you reappear on the other side of the screen.

About firing torps: Only four torps can be used at any one time. They are a resource that must be conserved. Don't just hammer on the firing button and let the machine decide when you have a new torp available. Pick your shots. If you don't, you'll be killed when you don't have a torp available when you need it to kill something nearby.

The enemy spaceships come in two sizes, stupid and nasty. The stupid (fat) one fires randomly and is a snap to hit, especially with a spread of torps. The other one fires torps at you and is hard to hit; he's the size of a small asteroid. He fires at you from angles slightly different from yours, with rare shots directly at you. The effect is that he leads you if you're moving relative to him—a deadly trick.

Now when Atari's engineers tested this game (most likely over a keg of beer—they've got pretty good working conditions there) they played it as they expected other people to, by going for asteroids. Sooner or later the field of view gets so cluttered you get blindsided no matter how good you are. The high score they got in testing was around 88,000. But here's

WHY THE MICROSOFT RAMCARD™ MAKES OUR SOFTCARD™ AN EVEN BETTER IDEA.

Memory — you never seem to have quite enough of it.

But if you're one of the thousands of Apple owners using the SoftCard, there's an economical new way to expand your memory dramatically.

16K ON A PLUG-IN CARD.

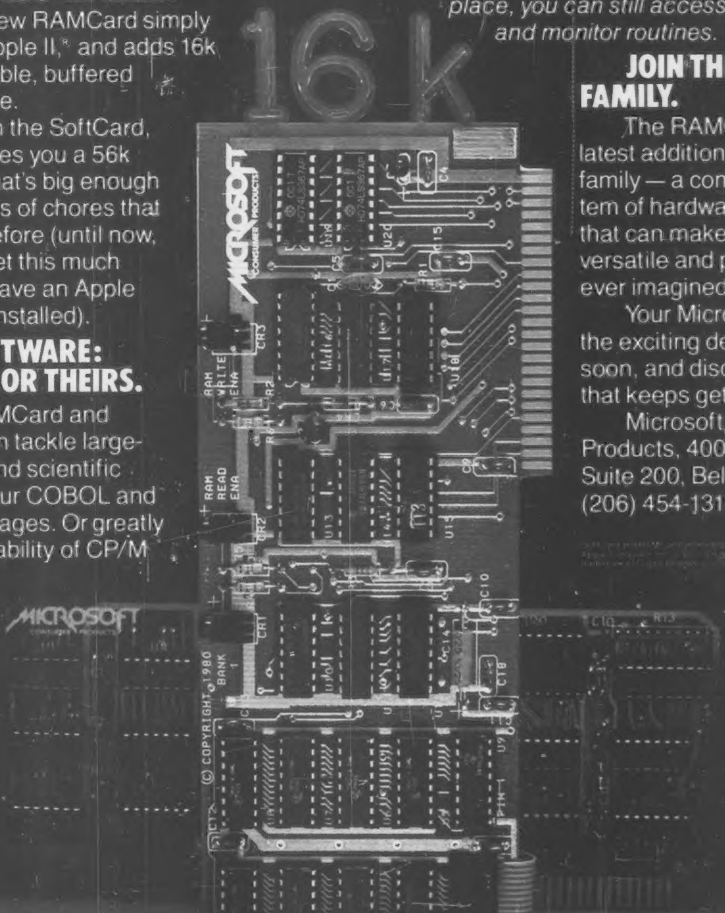
Microsoft's new RAMCard simply plugs into your Apple II,® and adds 16k bytes of dependable, buffered read/write storage.

Together with the SoftCard, the RAMCard gives you a 56k CP/M® system that's big enough to take on all kinds of chores that would never fit before (until now, the only way to get this much memory was to have an Apple Language Card installed).

GREAT SOFTWARE: YOURS, OURS, OR THEIRS.

With the RAMCard and SoftCard, you can tackle large-scale business and scientific computing with our COBOL and FORTRAN languages. Or greatly increase the capability of CP/M applications like the Peachtree Software accounting systems. VisiCalc™ and other Apple software packages can take advantage of RAMCard too.

And RAMCard gives you the extra capacity to develop advanced programs of your own, using the SoftCard and CP/M. *Even with the RAMCard in place, you can still access your ROM BASIC and monitor routines.*



JOIN THE SOFTCARD FAMILY.

The RAMCard is just the latest addition to the SoftCard family — a comprehensive system of hardware and software that can make your Apple more versatile and powerful than you ever imagined.

Your Microsoft dealer has all the exciting details. Visit him soon, and discover a great idea that keeps getting better.

Microsoft Consumer Products, 400 108th Ave. N.E., Suite 200, Bellevue, WA 98004. (206) 454-1315.

MICROSOFT

CIRCLE 172 ON READER SERVICE CARD

Introducing the premier award of the software industry.

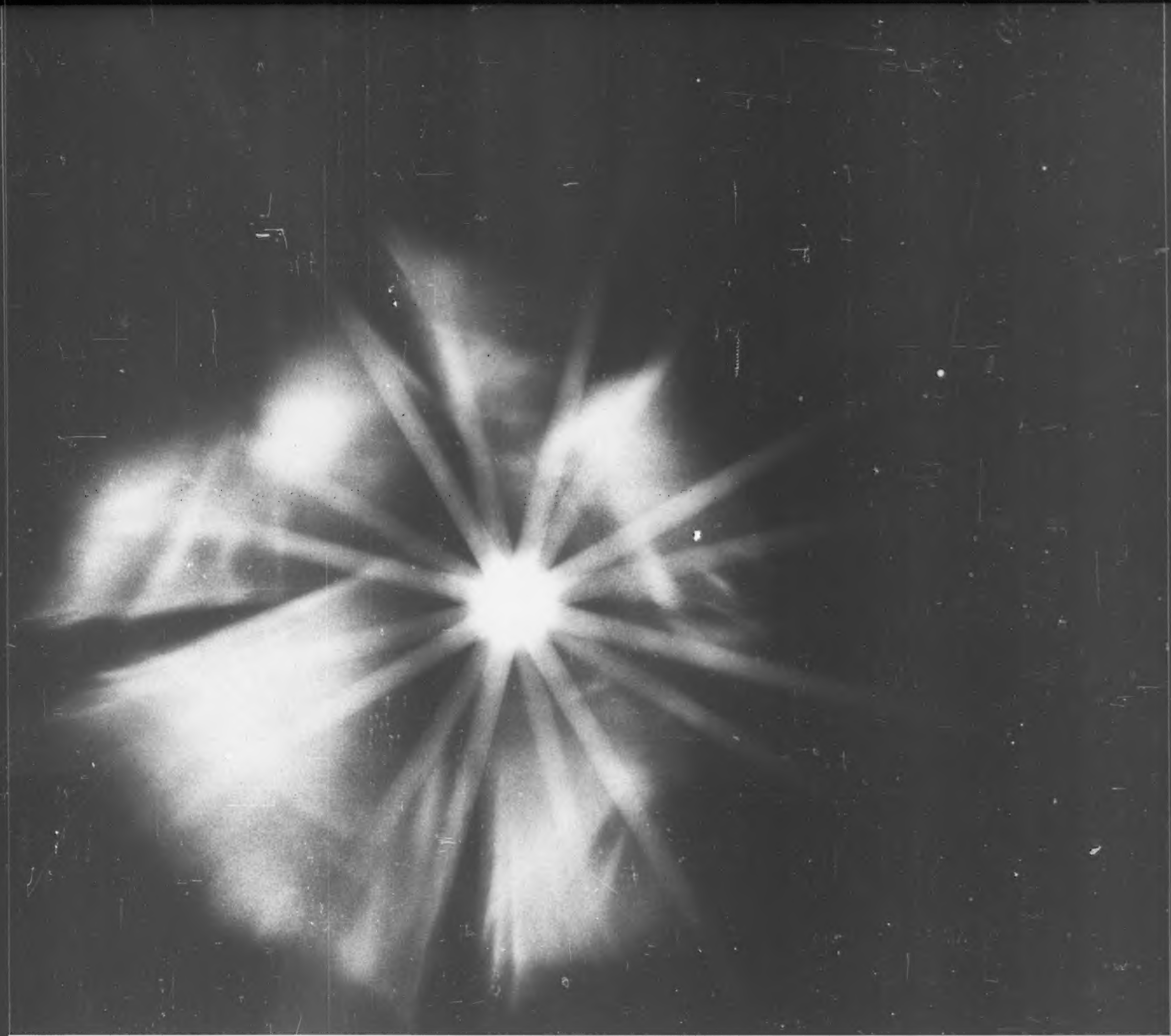
THE ATARI® STAR

Win $25,000 in cash, plus prizes and an ATARI STAR by entering your software in the ATARI® ASAP competition.

ATARI is looking for some of the greatest software from the brightest stars in the software field. And naturally, we're willing to reward you for it.

Every three months, ATARI will be presenting ATARI STARS to the writers of software programs judged first, second and third place in the following categories: consumer (including entertainment, personal interest and development); education; home business (personal finance and record keeping); and system software. The decision of the ATARI judges is final.

Quarterly prizes will be from $750 to $3,000 worth* of selected

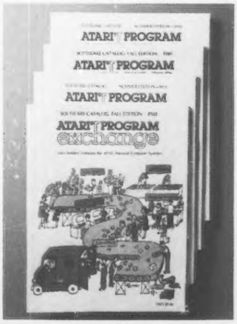


ATARI products and an ATARI STAR. The annual Grand Prize will be the coveted Super Star trophy and $25,000 in cash.**

To be eligible, your software idea must be submitted to and published in the ATARI Program Exchange catalog. Submit your program on the official entry form which we'll rush to you if you send in the attached coupon.

The ATARI STAR Awards are in addition to the percentage of revenues you will automatically be entitled to as a result of sales of your software programs in the ATARI Program Exchange.

If you're a star, ATARI wants to reward you. Send in the coupon today, or call toll-free 800-538-1862, in California 800-672-1850, and you could be the proud winner of an ATARI ASAP STAR Trophy, and some great ATARI prizes.



*Based on manufacturer's suggested retail price.

**Taxes are the sole responsibility of the winner. Void where prohibited by law. Winners will be notified by mail. ATARI employees and their families are not eligible. For more contest details, call the toll-free numbers.© 1981 ATARI, INC.

CIRCLE 118 ON READER SERVICE CARD

For more contest details, call 800-538-1862, in California 800-672-1850.

Send to: ATARI Software Acquisition
Program, 1196 Borregas, P.O.
Box 427, Sunnyvale, CA 94086

Yes, I want to enter the ATARI ASAP competition. Please rush me my entry form.

Name_______________
Address_______________
City_______________
State/Zip_______________

ATARI®

A Warner Communications Company

We've Brought The Computer Age Home.™

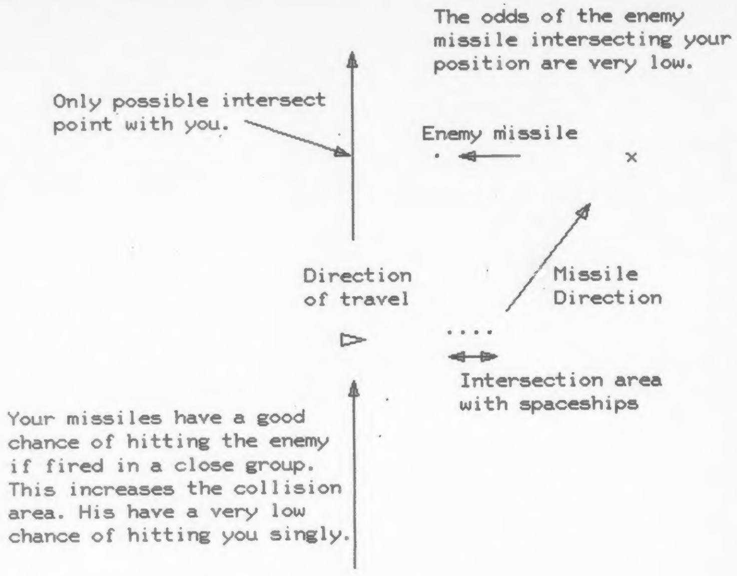

The odds of the enemy missile intersecting your position are very low.
Only possible intersect point with you.
Enemy missile
Direction of travel
Missile Direction
Intersection area with spaceships
Your missiles have a good chance of hitting the enemy if fired in a close group. This increases the collision area. His have a very low chance of hitting you singly.

Figure 4.

a technique they probably never thought of: ignore the asteroids and go for the small ships, each of which is worth 1000 points.

Blow away all the asteroids but one. It can be any size, but just have one left. Try to make it one that is moving more or less vertically; that will make your next task a bit easier.

Next, pour on the power straight up or down. You may have to shift this a bit to avoid the asteroid as necessary. Try to stay in midscreen. Now when an enemy spaceship appears, turn quickly to the side, fire a very quick burst of four torps to intersect his path, and keep going.

The strategy is as follows: His shots have a very low chance of hitting you, as they will be moving horizontally and you vertically. The chances of one colliding with your position in the brief time it's intersecting your vertical path are very small. But if you space you shots very closely, the odds of your shots hitting him are very high. Your firing speed will have to be very high (I use two fingers alternating on the button) and your shots should be spaced about one quarter inch apart; this will do the job well. You will frequently have to fire at the enemy using the wraparound effect of the screen to catch him as early as possible. See Figure 4.

If you should miss him until he reaches midscreen the chances of his shots colliding with you get much better. They intersect your path more often as he gets closer. Generally if I have missed him by this time, I give up and stay out of his way. You can do this by staying about half a screen away from him. Also, unless the game has been set up to be really nasty, he won't fire at "offscreen" positions, so you can use the wraparound effect to help you.

Now eventually one of your shots or one of his will hit the sole remaining rock and nail it. If it's a large one, no problem; just select which asteroid you want to remain. If, however, it was the last one, you're about to become quite busy. Slow down quickly and center your position, a heap of rocks is about to appear, and you will have to whittle them down again. This may be the most dangerous part of the whole strategy. The advantage of keeping a large rock should now be clear: it extends the open season on the little space ships.

Sure, you'll be killed eventually. But all you have to do to play forever is average a 1:10 kill ratio between you and the little ship, which isn't hard with practice using this technique.

By the way. There is supposedly a bug in the older version of the Asteroid games which allows you to sit in the lower left corner and never be killed. I do know that Atari rushed out a new set of ROMS for their machines, so it may well be true.

There's also a nastified version of Asteroids where the enemy ships do everything possible to kill you, including firing offscreen and such. Go easy on these machines. The less you play them, the fewer of them will be made. Finally, there is Asteroids Deluxe, in which the hyper control has been replaced by shields and in which certain asteroids break up into pieces which then attack and try to destroy you. Try it out; it's a new challenge and hard to beat.

Next, let's look at Galaxian, or Advanced Invaders.

Galaxian

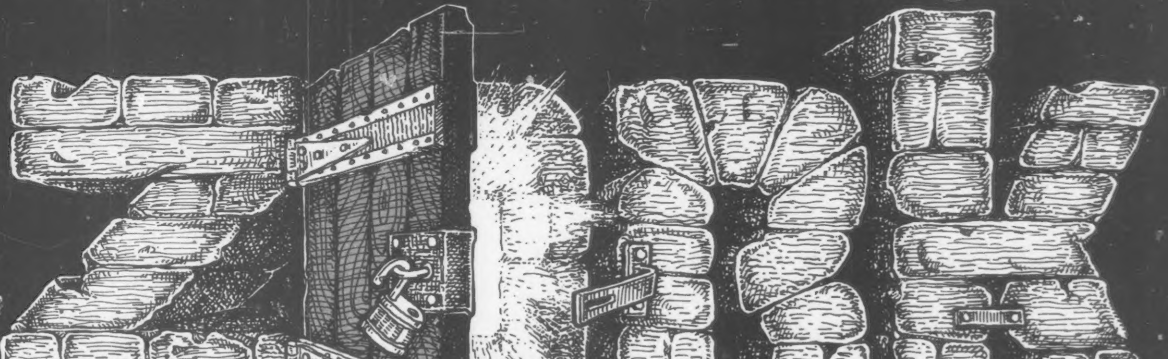
Galaxian is Space Invaders with a good bit of souping up. First, it's in color, which is neat (the colors do tend to dim on an old machine, though). The biggest difference is that the attackers peel off and come at you. I've found no "trick" to beat this game badly, just a set of tricks to stretch the ol' quarters.

First, destroy the enemies one column at a time. You will have to practice and perfect the little sideways jig required to lead the sideways moving invaders (i.e., fire, jig, fire, and so forth). Leave the red and yellow fellers until later; they are worth significant numbers of points. Killing the attackers off a column at a time increases your killing efficiency, and thus your scores, by reducing the time between your kills.

Interspersed with the above, you'll have to take out various attackers. Stay calm and pick your shots. You will soon find that a missed shot hurts badly because of the time wasted as your missile flies uselessly by. You'll be amazed at how quickly you'll be able to predict the paths of invaders well enough to lead and hit them; the light blue ones always come for you

MIDWAY'S
Galaxian

Just when you thought it was safe to go back underground again.



Your greatest challenge lies ahead—and downwards. Zork II: The Wizard of Frobozz, will be unlike any computer age adventure you've ever encountered. The underground world of Zork is designed to be lived and experienced in the most realistic sense. It features the largest vocabulary, the widest range of command options, the special capability to let you speak in complete sentences rather than two-word commands, and the most intriguing plot in the genre. And because Zork's mysteries are of the most challenging nature, it will take all your intellectual abilities to survive and emerge victorious from the Great Underground Empire.

Zork II is the extraordinary successor to Zork I, which hit #4 on the SOFTALK Top 30 in its first month on the market. Both run on 32K Apple II's with a 16-sector disk drive. And both are available now for Christmas.

The door to Zork beckons you. Look for it at your local computer store today.

INFOCOM

Zork is a trademark of Infocom, Inc.

Infocom, Inc., 6 Faneuil Hall Marketplace, Boston MA 02109

Apple II is a trademark of Apple Computer Corp.

CIRCLE 280 ON READER SERVICE CARD

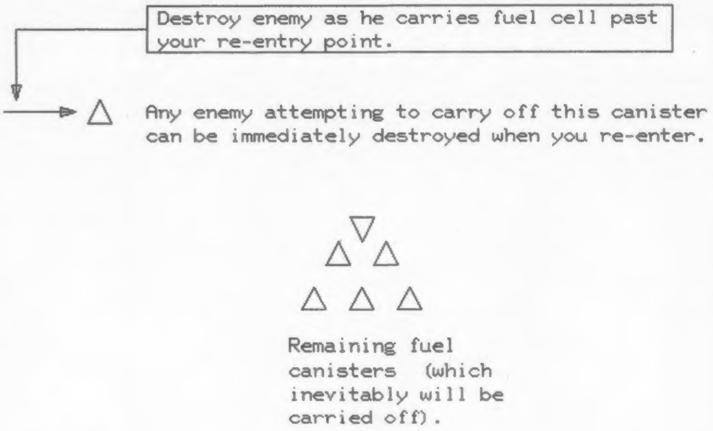

Destroy enemy as he carries fuel cell past your re-entry point.
Any enemy attempting to carry off this canister can be immediately destroyed when you re-enter.
Remaining fuel canisters (which inevitably will be carried off).

Figure 5.

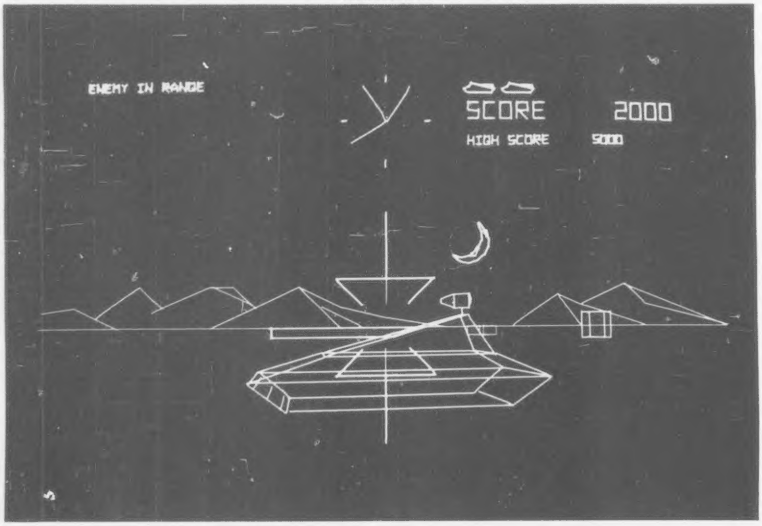
in a straight line, the purple ones have wild parabolic paths, and so on. One helpful trick is to keep your eye on the one ship at which you are aiming while you fire.

Zap the triple group red ones first, then the yellow ones. You'll get 800 points for this order if you manage it. One important point about the yellow ones is that if you destroy an attacking yellow ship, all ships attacking stop firing at you. This can save you if you are pinned down by a large wave.

Watch the purple ships! Their parabolas can be pretty radical—even to the point where they'll hit you from the side. The parabolas get wilder as the game progresses. All ships key on your position as of the moment they peel off to attack, and aim to intersect at that point. Use this to help you. For example, if you're in a corner when they peel off, you're likely to be trapped.

At the end of each rank, when only two or three enemies are left, things get pretty tough. Try to pick off the attackers at the top of the screen, before they start dodging. One thing they do can be turned to your advantage: they follow your movement control, so if you dodge left, they will, too. Try wobbling your control back and forth, and the enemy will dance all over the screen. Remember that if you keep the control pegged to one side or another, you're giving the attacker unnecessary assistance. Should you be pinned on one side, with him coming across at you, center the control; that will help prevent him from getting far enough over to hit you.

Battlezone.



RipOff

Never, never play RipOff alone. It is truly a rip off if you do. The machine's edge, as you will have figured out by now, is the time between your death and re-entry. With one player, you haven't got a chance. With two, your partner can cover for you while you get back in.

You will always be killed in RipOff. There's really nothing you can do about it with the high speed enemy ships, since by the time you can see them you're dead. If you have a partner, however, and you stay split up, they can't usually get both of you at once.

If an intruder should "drop" a fuel cell near your re-entry point, you have it made. Generally, they are not too co-operative about dropping it for you, so you will have to kill them there. Anytime you get killed, you will come back in a fine position to cover the fuel cell. Let an enemy go for a bit if it looks like he's headed that way, then kill him when his vertical position is the same as the entry point. I manage a Bonus +120 or so with little trouble when this happens. See Figure 5.

Fire into corners and edges during the times between enemy attacks. You may catch the enemy as he enters the screen and take him out, and believe me, you need all the help you can get. Your partner should select another edge and fire at it.

The best way to win this game is the firing technique. A good bet is "walking the rudders" while firing to spread out your shots from a straight line; this gives you a much larger collision area with the enemies. Once you have some practice you will be able to lay a one-inch wide spread easily, which is quite effective for killing enemy ships, one good hint for just before you die on a new fast enemy wave is to fire a spread into the fuel cells; generally some idiot enemy ship will fly right to the center, and be killed even as you die.

I generally fly straight at the enemy, ensuring that I get him even if I miss him with my shots. One problem with RipOff reflexes, however, is that the rudder walking and collision habits you build up are exactly what you don't need to win at Asteroids. Ah, well.

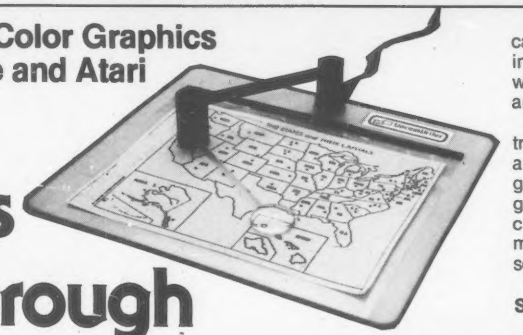
Battlezone

First, should you have a comment or suggestion about Battlezone, there's a guy you can send it to. He's not an official PR person, but rather the manager of the coin-op group that invented it: Ed Rotberg, Coin-Op Supervisor, Atari Inc., 1196 Borregas Ave., Sunnyvale, CA 94086.

Tell him Dave sent you. (He'll probably never speak to me again for this, but maybe someone will send him some good ideas.)

Here are a few very helpful hints for this addictive game.

High-Resolution Color Graphics for the Apple and Atari



Graphics Breakthrough

How many programs have you written that would benefit from animated high-resolution graphics? Probably several. It is this kind of dramatic graphics that distinguish outstanding programs from ordinary ones. But if you've ever agonized for hours or days just to get one image perfected, you're probably not anxious to do it again. Now there's a better way.

New Graphics Entry System

Today there is a new graphics system available that is not only amazingly user-oriented but surprisingly economical. Called VersaWriter, it starts with an ingeniously simple entry board consisting of a 14" X 12" high impact plastic bed with a tough clear plastic overlay sheet. The original drawing or diagram is fastened with masking tape to the plastic bed and then covered with the clear sheet. Instead of using a light pen or complicated electronic X-Y head, the VersaWriter uses a double jointed arm attached to the top of the entry board at one end and a magnifying lens with crosshairs at the other end. The VersaWriter resembles a draftsman's pantograph on a smaller scale.

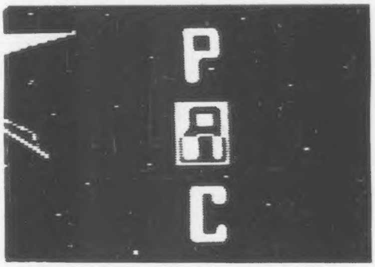
At each joint in the arm of the VersaWriter is a potentiometer. A cable from these pontentiometers connects to the paddle input of the computer. No special interface electronics or board is needed. Since the arm of the VersaWriter bends only in one direction, each point on the plotting head corresponds to a unique set of resistances on the potentiometers. All that's needed now is software to translate these resistances into usable screen coordinates.

Exceptionally powerful software

It is in the software where VersaWriter really stands out. VersaWriter comes with two full disks of user-oriented software. First it has sets of "low level" commands for entering, creating and copying drawings and diagrams. Secondly, it has extensive sets of application routines for moving, enlarging, rotating, coloring or animating drawings that the user has created. Of course the basic commands let you enter a drawing freehand or by tracing it. Want a wider brush stroke? Six widths are available. Drawings can be independently scaled in both the vertical and horizontal directions. An enclosed shape may be filled in with any of 106 colors. No, that is not a misprint—By the same technique that a printing press can create hundreds of colors from the three primary ones, so can VersaWriter.

Graphics Systems

Versa Writer	**$249.00**
Kurta Graphics Tablet	**695.00**
Summagraphics Digitizer	**745.00**
Houston Instruments Hi Pad	**795.00**
Apple Graphics Tablet	**795.00**



Here a shape (the letter A) is being scanned. After putting it in a shape table it may be used in other programs.

```
ENTER COMMAND                X= 279
                             Y= 0
```

From the shape table, a shape (the letter A) may be enlarged, rotated, colored or moved about the screen.

Create Animation for Other Programs

The shapes you create with VersaWriter can be used and manipulated with ease in other programs. Up to 255 shapes can be entered into a shape table. These shapes may then be placed on the screen in any position or may be overlaid on a full or partial screen image. Animation is produced easily by moving about a portion of the image created by VersaWriter. For example, by alternating between two images of an airplane propeller it will appear to be spinning.

Other VersaWriter software includes text-writer with which text can be added to graphics. Upper and lower case, choice of color, text size, direction and starting point all may be specified.

The Area/Distance program lets you calculate distances (or perimeters) by entering a scale and tracing a shape or map route with the drawing arm. Areas of figures, open and irregular, can be similarly calculated.

The software also includes sets of electronic and computer logic shapes. In addition, an entire disk of dramatic demonstration graphics is included. These twelve full-screen graphics run the gamut from a fully labeled cross section of a human skull to colored maps to animated cartoons to an electronics schematic.

Software Updates

You may have read a review of VersaWriter that indicated that the color fill routine was slow. It was. But not any more. Several routines and improvements were added to the VersaWriter software since its introduction. An added feature, the Expansion Pac, is also now available. This third disk of software contains an area distance program, a microscope feature, and will save your graphics in the exact colors you prefer. It also includes shape tables for architecture, plumbing, electrical, circuit boards, landscape, chemistry, games, and more; 350 predefined shapes in all.

At Peripherals Plus, we evaluated every graphics device. We wanted to handle the best one regardless of price. VersaWriter has the best performance bar none. Surprisingly, it also has the lowest price, just $299.00 for the Apple version. It requires an Apple II Applesoft in Rom (or an Apple II Plus), disk, and 48K memory. VersaWriter comes complete with two disks of software, a comprehensive instruction manual, and a 90-day limited warranty. The additional Expansion Pac is available for $39.95.

The Atari version, which varies slightly from the Apple version in number and types of functions performed, is available for $299.00. As new updates are developed for the Atari, Peripherals Plus will furnish them free to all customers—just send us the disk and we'll supply the updated material. We make this unique offer because it is in our best interest to have you make the best use of your computer. We're also convinced that if other people see your VersaWriter in use they'll want one too.

Try VersaWriter for 30 days. If you are not completely satisfied we'll give you a prompt and courteous refund of the full price plus shipping both ways.

To order, specify Apple or Atari version, send payment plus $3.00 shipping and handling to Peripherals Plus, 39 East Hanover Ave., Morris Plains, NJ 07950. (New Jersey residents please add 5% Sales tax.) Credit card customers should include card number and expiration date of Visa, MasterCard or American Express card. Credit card customers may also call toll-free 800-631-8112 (in NJ 201-540-0445).

For spectacular graphics on your computer, order VersaWriter today.

Peripherals Plus

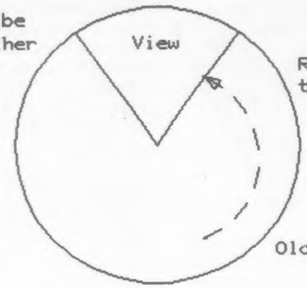
39 E. Hanover Ave.,
Morris Plains, NJ 07950
Toll-free **800-631-8112**
(In NJ 201-540-0445)

CIRCLE 239 ON READER SERVICE CARD

Apple is the registered trademark of Apple Computer, Inc.

Figure 6.

The enemy can be brought to either diagonal line by rotating with just one control forward.

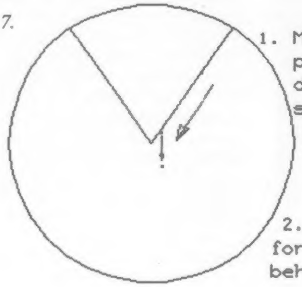


Rotate the enemy to this position.

Old enemy position

Battlezone radar display

Figure 7.

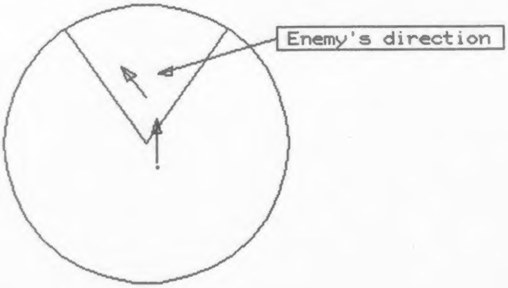


1. Move enemy from his position on either diagonal line to a spot close to your position.

2. Move straight forward to bring him behind you.

3. The enemy tank will now rotate to face your position forward from him.

Figure 8.



Now back up quickly. The enemy will be in your viewscreen, still pointing ahead. He'll begin to turn towards your new position, but you'll have plenty of time to kill him before he can finish turning.

Enemy tanks *never* lead you. This means that you must *keep moving*! If you have one handle forward, you're moving forward in a slow curve and are OK; if you have one forward and one back, you're sitting in one spot, and have little time to live. Never do this except just prior to zapping a tank.

To kill a tank, reliably:

1. Wait until the tank appears on the radar. If he appears right in front of you, try zapping him once carefully, then turn and move cause he'll start firing soon. Note his radar plot position.
2. Move him, by moving one handle only, to twin diagonal lines on the radar display. If he's behind you, you can back up also. Be patient, and spin him around to one of the lines. See Figure 6.
3. Bring him toward you down the line with a combination of forward and one handle forward. When he gets close, go straight forward, and continue until he's one quarter inch or so on the display behind you. See Figure 7.
4. Back up quickly, right in front of him. He'll still be pointing forward, not back. Spin to his side (going up there and running into him is fun, too) and blow him away. See Figure 8. This works every time. What more could you ask?

Minor Flourishes: If you should hit a barrier while backing up, or rotating, keep moving away from it, then go around.

Super tanks are handled in the same way. Don't let them get directly behind you, or you're dead. Keep them in the forward area and expect them to try to run into you; they're designed to. Count on the collision and see what you can do to out-turn them.

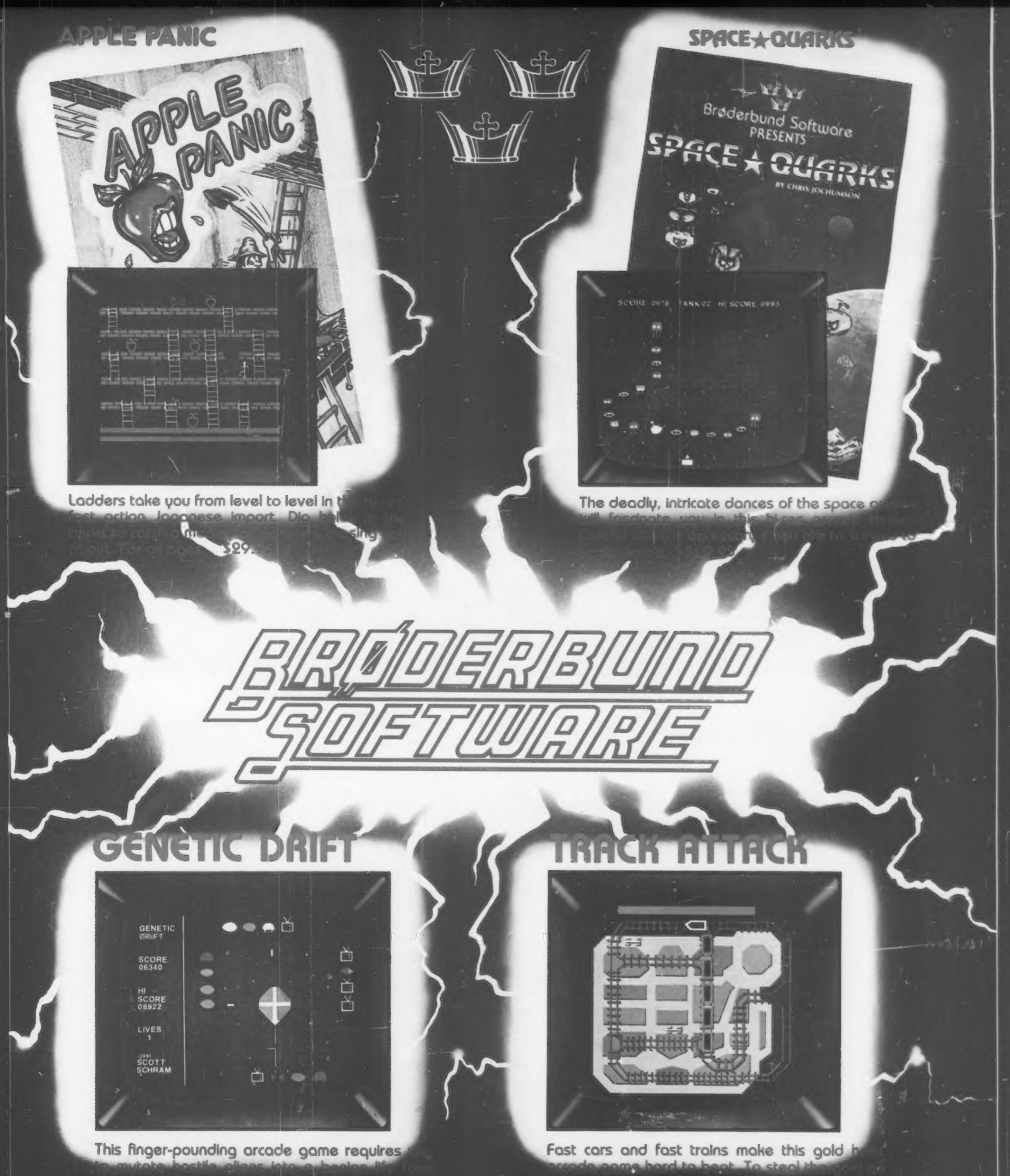
The Saucer always tries to maneuver you into the worst possible position. For example, it tries to line up a tank directly behind you by heading that way and encouraging you to turn in that direction. If this happens you haven't long to live. Sometimes, however, the enemy hits his own saucer!

Buzzbombs

I hate Buzzbombs.

The first couple are simple. You can blow them away as they come at you. But then they begin to dodge back and forth until there's no clear shot at them, and they zap you from the side. I tried *everything* and spent a lot of money until I learned their secret.

I reasoned it out as follows: The tank you are driving has no "depth" to the machine. Hence, I wondered, if you were right up against a barrier (which I had seen buzzbombs hop), would they hop you too? The answer is yes. If you're snuggled up against a barrier in the way of a buzzbomb coming at you, it will hop the barrier and *miss* you every time. See Figure 9.


APPLE PANIC
SPACE★QUARKS
Brøderbund Software
PRESENTS
SPACE★QUARKS
BY CHRIS JOCHUMSON
SCORE 0978 TANK 02 HI SCORE 0993
GENETIC
DRIFT
SCORE
06340
HI
SCORE
08922
LIVES
1
©1981
SCOTT
SCHRAM

APPLE PANIC

Ladders take you from level to level in th[illegible] fast action Japanese import. Dig hol[illegible] bricks to catch a m[illegible] chasing [illegible] about. For all ages. $29.95

SPACE★QUARKS

The deadly, intricate dances of the space [illegible] will fascinate you in this hi-res arcade [illegible] Careful study is necessary if you are to survive to [illegible] $29.95

BRØDERBUND SOFTWARE

GENETIC DRIFT

This finger-pounding arcade game requires [illegible] to mutate hostile aliens into a benign life form even as they attack from all sides. But watch out! One slip and the friendly ones become deadly once again. $29.95

TRACK ATTACK

Fast cars and fast trains make this gold h[illegible] arcade game hard to beat. To steal the gold on the train while avoiding other cars, you need great timing and good peripheral vision. $29.95

All products require 48K Applesoft or Apple II Plus and one disk drive. 13 or 16 sector controller.

ASK YOUR DEALER OR SEND CHECK OR MONEY ORDER TO:

Brøderbund Software • 2 VISTA WOOD WAY, SAN RAFAEL, CA 94901 • (415) 456-6424

CIRCLE 322 ON READER SERVICE CARD

IF YOU'RE WAITING FOR THE PRICE OF WORD PROCESSORS TO FALL WITHIN REASON,

IT JUST DID.
commodore
CBM
Model 8032
WordPro 4
PLUS
OFFICIALLY APPROVED
COMMODORE DEALER

Everyone expected it would happen sooner or later...with WordPro PLUS™ it already has! Now all the marvelous benefits of expensive and advanced word processing systems are available on Commodore computers, America's largest selling computer line. WordPro PLUS, when combined with the new 80 column CBM 8032, creates a word processing system comparable to virtually any other top quality word processor available—but at savings of thousands of dollars!

New, low cost computer technology is now available at a fraction of what you would expect to pay. This technology allowed Commodore to introduce the new and revolutionary CBM 8032 Computer.

WordPro PLUS turns this new CBM 8032 Computer into a sophisticated, time saving word processing tool. With WordPro PLUS, documents are displayed on the computer's screen. Editing and last minute revisions are simple and easy. No more lengthy re-typing sessions. Letters and documents are easily re-called from memory storage for editing or printing with final drafts printed perfectly at over five hundred words per minute!

Our nationwide team of professional dealers will show you how your office will benefit by using WordPro PLUS. At a price far less than you realize.

Invest in your office's future...
Invest in WordPro PLUS...
Call us today for the name of the WordPro PLUS dealer nearest you.

Professional Software Inc.
166 Crescent Road
Needham, MA 02194
(617) 444-5224
TELEX: 95 1579

CIRCLE 251 ON READER SERVICE CARD

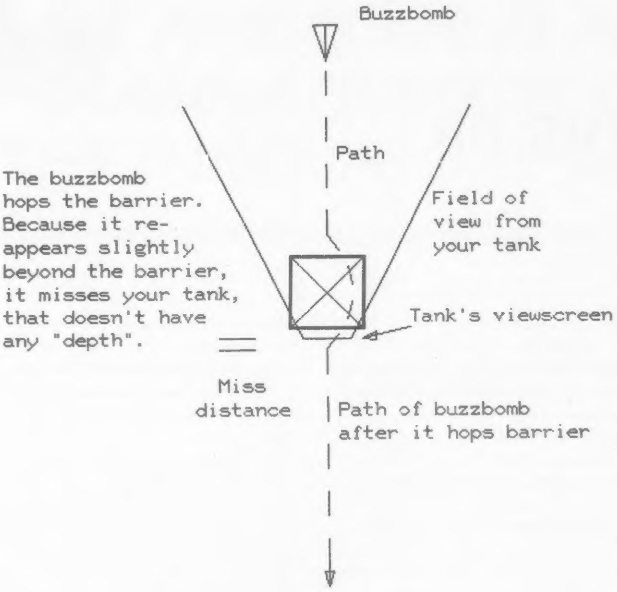

Buzzbomb
Path
The buzzbomb hops the barrier. Because it re-appears slightly beyond the barrier, it misses your tank, that doesn't have any "depth".
Field of view from your tank
Tank's viewscreen
Miss distance
Path of buzzbomb after it hops barrier

Figure 9.

I can hear those of you who have experienced the Buzzbomb Certain Death saying, "Yeah? Neat!"

Using the Battlezone barriers this way is a joy. See buzzbombs that would be deadly hop right over you. Learn the art of hanging back from the barrier a little, taking a potshot at the buzzer as it comes for you, then running for cover if you miss. Supertanks may also be clobbered this way; they will come straight for you, firing all the way. Interpose a barrier and they will hit it. Be on the other side, naturally, and back up a tad. He will back way up to one side. As soon as his tail end is visible, blast him. It's an excellent way to finish off a tough opponent.

Conclusion

I love video games. I'm looking forward to the next introduction of a new one. There's a new one with about three zillion controls called Defender that I'm starting to look over now, and I still have plenty of quarters ready. I hope the advice I've given will stretch your playing time and paycheck some, and increase your enjoyment of the games.

Good luck! Oh, and if you should find any other good strategies, please feel free to drop me a line at the address listed in the beginning of this article. I'm always looking for new ideas! ☐

Hot New Arcade Games Apple II

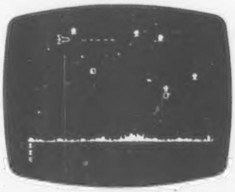
Blister Ball/ Mad Bomber

This completely original arcade game is only available on your Apple, not in the arcades. Some mean but fun loving aliens have produced some bouncing bombs. You have to move under them and zap them with your laser without getting hit. They drop one at a time, then two, then three, then four, then five. Next you have to contend with 5 bonus bombs, which do not bounce, but are worth five times as much. You need nerves of steel and the reflexes of a tail gunner.

BLISTER BALL

The disk also includes Mad Bomber. You must destroy the bombs as the bomb racks are filled, for if you don't stay ahead of them, you don't have a chance. Both games can be played solo or by two players, either against each other or as a team. Two games, on disk, (DOS 3.2), requiring 48K Apple with paddle controls, CS-4511 $24.95

Torax



Defend your home planet against the invading Torids! Shoot down the invaders, but don't hit the nuclear fuel tanks that they are intent on stealing. The six highest scores are permanently stored on disk with your initials. This high-speed, real-time action arcade game requires a 32K Apple or Apple II Plus and game paddles. Diskette CS-4520, $24.95

Order Today

To order these software packages, send payment plus $2.00 postage and handling per order to the address below. Visa, MasterCard and American Express orders may be called in toll-free.

Order today at no risk. If you are not completely satisfied, your money will be promptly and courteously refunded.

creative computing software

Morris Plains,
N.J. 07950

Toll-free
800-631-8112

in N.J.
201-540-0445

Super Vaders and Space Intruders

Invaders for the TRS-80

Owen Linzmayer

The software market has been saturated with versions of Space Invaders for the TRS-80; few great, some OK and many horrendous. Rather than criticizing the deplorable, this review is intended to praise two exemplary programs modeled after the famous arcade game. The programs are Super Vaders from Soft Sector Marketing and Space Intruders from Adventure International.

Space Invaders is the grand-daddy of arcade games. In it, rows of aliens march left and right, criss-crossing the screen, launching lethal missiles at the lone defender below. When the army of invaders reaches either side of the screen, it drops down one step closer to the player's laser base. If the invaders manage to get down to the level of the cannon, the game is over and the Taito Corp. is twenty-five cents richer.

As the number of intruders decreases, the speed of the remaining aliens increases. When the first screenful of invaders has been cleared, a second, faster group appears; only this time they start off a notch lower than the preceding wave.

Even though there are four shelters to protect him, the player must constantly be on the alert as he glides across the bottom of the screen picking off any unfortunate invader that gets caught in his line of fire. Occasionally, a UFO will transverse the uppermost portion of the sky, daring the player to blow it away.

Although these UFOs are worth big points, their objective is to draw your attention away, in the hopes that you won't notice an oncoming missile. The arcade version of Space Invaders is endless, if you can manage to keep one base intact you may play forever, racking up scores in excess of hundreds of thousands of points.

Super Vaders

Super Vaders is a machine language program written by Larry Ashmun of Soft Sector Marketing. It is a modified and greatly enhanced version of Invaders Plus. There are nine levels of play, not including the Blitz mode. Blitz is not for the timid; bombs are hurled towards you at dizzying speeds as the invaders whiz through the heavens. I'm told by the author that the number of boards/screens in the Blitz mode is infinite, but I have never gotten past the second set of insuperable invaders.

If you are playing any level other than Blitz, you must destroy only four waves of invaders before the game is over. This is a slight drawback, but with nine levels of play, the game is challenging to novice and expert alike. At the beginning of each new onslaught, the number of laser bases is always four (these will disappear quicker than you think).

The sound-effects are exceptional.

Every time one of your bases is destroyed, the number of ships left is flashed momentarily where your last ship was hit. This is a novel feature that more programs should use. In the old version of Invaders Plus, you could only do one thing at a time, move or shoot. In Super Vaders you can do both simultaneously, with rapid-fire shooting no less!

creative computing
SOFTWARE PROFILE

Name: Super Vaders
Type: Arcade
System: TRS-80 Model I/III, 16K
Format: Cassette or disk
Language: Machine
Summary: Top of the line Space Invader game for the TRS-80
Price: $19.95
Manufacturer:
Soft Sector Marketing
6250 Middlebelt
Garden City, MI 48135

The sound-effects are exceptional. Something is always coming out the cassette port, from the zapping of an invader to the ever-increasing background tempo which intensifies the game.

There are only two small complaints I have about this game. The first dealing with the scoring: your score is only shown after the game is completed. This is a minor problem but I can see why it was done this way. To have on-screen scoring, the top row would have to be set aside for the score section instead of being reserved for the UFO ship.

My second complaint is that the two-player option is not really that at all. The second player doesn't get to man the controls until after his opponent has been annihilated four times and is finished with his game.

Space Intruders

Space Intruders, also a machine language program, is written by Doug Kennedy. It differs from Super Vaders in that it is modeled after Space Invaders Part II (commonly know as Deluxe Space Invaders). Intruders replicates every aspect of the arcade game, and very well, I might add.

One of the first differences between the original and deluxe arcade games you will notice is that there are "splitting invaders." That is, if you hit one, it duplicates itself and a clone appears beside it. These two do not split again if hit.

There are three different types of UFOs in Space Intruders; the regular ship, a flashing ship and a reinforcement ship. The flashing UFO blinks on and off as it flies across the screen. To destroy it, your laser blasts must hit it when it is "on." The reinforcement ship periodically comes by to drop extra aliens into the empty slots in the uppermost row. This can be nerve-wracking when you thought you

THEY SAY THE JAPANESE ARE COMING AND WILL DOMINATE MICROCOMPUTING. THE INNOVATORS SAY WELCOME!

In 1978 Exidy introduced the Sorcerer® Microcomputer to the personal computer marketplace.

It was clearly ahead of its time and the competition in price and performance. The graphics were superior, upper/lower case characters were standard and numeric keyboard was included. Printer, communication and dual cassette electronics were built-in, not options. Twice as much information was displayed on the screen. **The competition created their next generation to catch up.**

MP/M, CP/NET and CP/NOS are trademarks of Digital Research, Inc

In 1980 Exidy introduced their integrated desktop Computer System 80 for the very small business. It was an extension of the Sorcerer® computer . . . not obsoleting it but expanding its capacity from the home to the office. Its price/performance outstripped the competition in desktop computers. Dual disk drives with 1.2 million words of information, letter quality printer and office automation software . . . **a complete business computer breaking a new price barrier.**

EXIDY SYSTEMS

1234 Elko Drive
Sunnyvale, California 94086
(408) 734-9831

In 1981 Exidy Systems introduced Multi-Net 80, the first multi-processor, multi-user, multi-tasking computer system with MP/M™, CP/NET™ and CP/NOS™ for the serious small business. Once again the Multi-Net is an extension of the same Sorcerer® Computer purchased in 1978 or 1980. Your 'getting started' computer becomes your 'getting serious' computer in a multi-user, multi-task environment. **Networking becomes a reality with Exidy Systems, with our competition it's a twinkle in their eye.**

By adding Multi-Net 80 capacity to your stand alone computer system you add a minimum of 35 megabytes of Winchester storage and true 16 user capability because each user has their very own CP/M compatible Z80 microcomputer. That's true upward compatibility in both hardware and software from the company that delivers Innovation in Microcomputing™.

What do we say about competition? We welcome it!!!

INNOVATION IN MICROCOMPUTING™

CIRCLE 177 ON READER SERVICE CARD

Invaders, continued...

were almost finished with a wave and suddenly more intruders are strewn in your path to victory.

Space Intruders is so much like Deluxe Space Invaders that it even has two features many people don't even know exist in the arcade game. The first is "counting your shots." Contrary to popular belief, the UFO point values are not random, but rather follow a pattern depending on the number of shots you have fired. By counting shots and hitting the UFO at the right time, you can consistently get the maximum point rating.

> **creative computing**
>
> **SOFTWARE PROFILE**
>
> **Name:** Space Intruders
>
> **Type:** Arcade
>
> **System:** TRS Model I/III, 16K
>
> **Format:** Cassette or disk
>
> **Language:** Machine
>
> **Summary:** Excellent TRS-80 rendition of Deluxe Space Invaders
>
> **Price:** Space Intruders $19.95 tape Model I and III, $20.95 disk Model I
>
> **Manufacturer:**
> Adventure International
> Box 3435
> Longwood, FL 32750

Dave Powell

"Come now, Mary—what makes you think we're being attacked by invaders from outer space?..."

The other feature, one that only a few people know about, is referred to as the "rainbow effect." If the last alien on the screen is one from the bottom row and you destroy it, you are awarded bonus points and treated to an interesting graphics display (the rainbow).

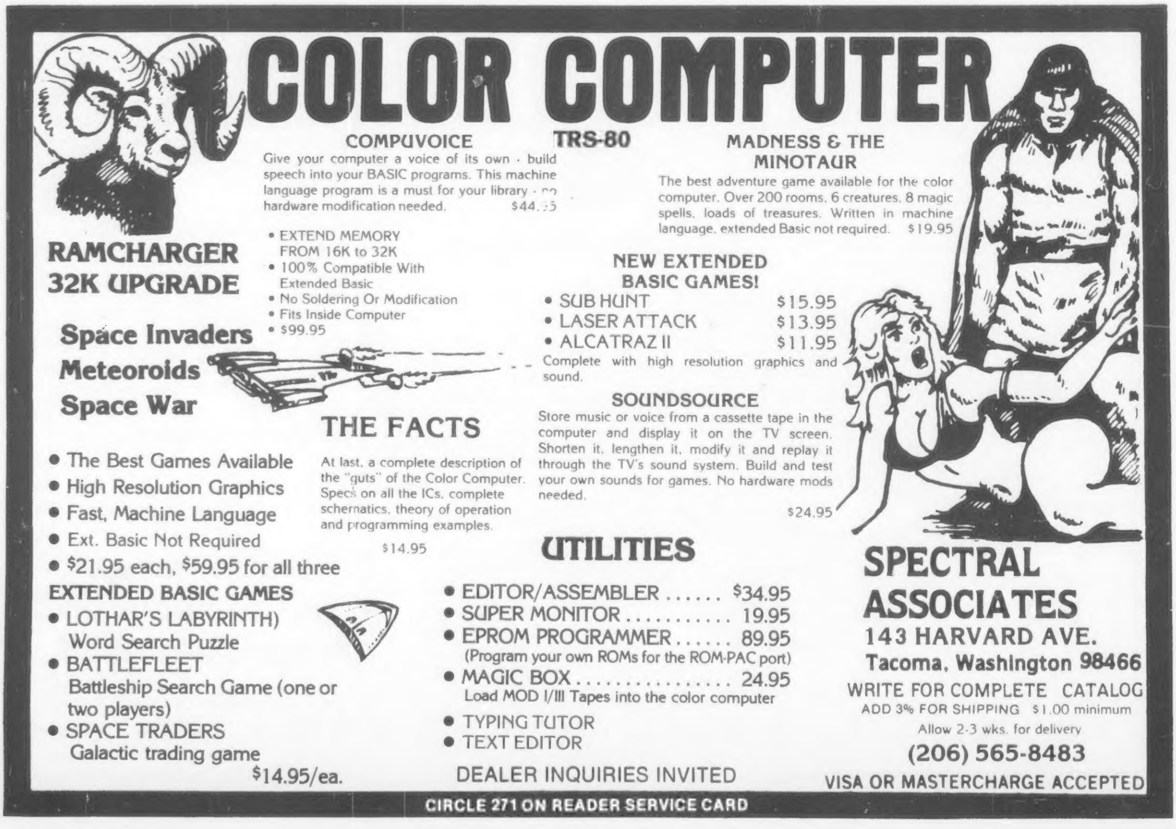
There is a two-player option in this program in which players alternate turns after being destroyed, but the time allotted for changing positions is not sufficient.

One extra ship is awarded at 2000 points; that's the only freebie you'll get, so use it well. Unlike Super Vaders, this program does have on-screen scoring and also lets the high-scorer input his name (eight letters maximum). On the lower left, the number of ships remaining is shown and at the right, the number corresponding to the wave you are presently battling.

Both Super Vaders and Space Intruders use excellent sound routines and lightning-fast, smooth graphics. They are the top-of-the-line Space Invader games for the TRS-80. I don't recommend one over the other because they are modeled after different games.

Contrary to popular belief, the UFO point values are not random.

If you like the original Space Invaders then get Super Vaders, if you prefer the Deluxe arcade game, then by all means, get the Space Intruders program. Better yet, buy them both. Then you'll have all the invader games you'll ever need. Both games are virtual black-holes, capable of sucking up hours and hours of play time while improving your game. ☐


COLOR COMPUTER
TRS-80

COMPUVOICE
Give your computer a voice of its own · build speech into your BASIC programs. This machine language program is a must for your library · no hardware modification needed. $44.95

RAMCHARGER
32K UPGRADE
- EXTEND MEMORY FROM 16K to 32K
- 100% Compatible With Extended Basic
- No Soldering Or Modification
- Fits Inside Computer
- $99.95

MADNESS & THE MINOTAUR
The best adventure game available for the color computer. Over 200 rooms, 6 creatures, 8 magic spells, loads of treasures. Written in machine language, extended Basic not required. $19.95

NEW EXTENDED BASIC GAMES!
- SUB HUNT $15.95
- LASER ATTACK $13.95
- ALCATRAZ II $11.95

Complete with high resolution graphics and sound.

Space Invaders
Meteoroids
Space War
- The Best Games Available
- High Resolution Graphics
- Fast, Machine Language
- Ext. Basic Not Required
- $21.95 each, $59.95 for all three

THE FACTS
At last, a complete description of the "guts" of the Color Computer. Specs on all the ICs, complete schematics, theory of operation and programming examples.
$14.95

SOUNDSOURCE
Store music or voice from a cassette tape in the computer and display it on the TV screen. Shorten it, lengthen it, modify it and replay it through the TV's sound system. Build and test your own sounds for games. No hardware mods needed.
$24.95

EXTENDED BASIC GAMES
- LOTHAR'S LABYRINTH)
  Word Search Puzzle
- BATTLEFLEET
  Battleship Search Game (one or two players)
- SPACE TRADERS
  Galactic trading game

$14.95/ea.

UTILITIES
- EDITOR/ASSEMBLER $34.95
- SUPER MONITOR 19.95
- EPROM PROGRAMMER 89.95
  (Program your own ROMs for the ROM-PAC port)
- MAGIC BOX 24.95
  Load MOD I/III Tapes into the color computer
- TYPING TUTOR
- TEXT EDITOR

DEALER INQUIRIES INVITED

SPECTRAL ASSOCIATES
143 HARVARD AVE.
Tacoma, Washington 98466
WRITE FOR COMPLETE CATALOG
ADD 3% FOR SHIPPING $1.00 minimum
Allow 2-3 wks. for delivery
(206) 565-8483
VISA OR MASTERCHARGE ACCEPTED

CIRCLE 271 ON READER SERVICE CARD

The story behind the two best selling computer games books in the world.

Computer Games

by David H. Ahl

Everybody likes games. Children like tic tac toe. Gamblers like blackjack. Trekkies like Star Trek. Almost everyone has a favorite game or two.

It Started in 1971

Ten years ago when I was at Digital Equipment Corp. (DEC), we wanted a painless way to show reluctant educators that computers weren't scary or difficult to use. Games and simulations seemed like a good method.

So I put out a call to all our customers to send us their best computer games. The response was overwhelming. I got 21 versions of blackjack, 15 of nim and 12 of battleship.

From this enormous outpouring I selected the 90 best games and added 11 that I had written myself for a total of 101. I edited these into a book called 101 Basic Computer Games which was published by DEC. It still is.

When I left DEC in 1974 I asked for the rights to print the book independently. They agreed as long as the name was changed.

Converted to Microsoft Basic

The games in the original book were in many different dialects of Basic. So Steve North and I converted all the games to standard Microsoft Basic, expanded the descriptions and published the book under the new name Basic Computer Games.

Over the next three years, people sent in improved versions of many of the games along with scores of new ones. So in 1979, we totally revised and corrected Basic Computer Games and published a completely new companion volume of 84 additional games called More Basic Computer Games. This edition is available in both Microsoft Basic and TRS-80 Basic for owners of the TRS-80 computer.

Today Basic Computer Games is in its fifth printing and More Basic Computer Games is in its second. Combined sales are over one half million copies making them the best selling pair of books in recreational computing by a wide margin. There are many imitators, but all offer a fraction of the number of games and cost far more.

The games in these books include classic board games like checkers. They include challenging simulation games like Camel (get across the desert on your camel) and Super Star Trek. There are number games like Guess My Number, Stars and Battle of Numbers. You'll find gambling games like blackjack, keno, and poker. All told there are 185 different games in these two books.

Whether you're just getting started with computers or a proficient programmer, you'll find something of interest. You'll find 15-line games and 400-line games and everything in between.

The value offered by these books is outstanding. Every other publisher has raised the price of their books yet these sell for the same price as they did in 1974.

Moneyback Guarantee

Examine one or both of these books and key some games into your computer. If you're not completely satisfied we'll refund the full purchase price plus your return postage.

Basic Computer Games costs only $7.50 and More Basic Computer Games just $7.95 for either the Microsoft or TRS-80 edition (please specify your choice on your order). Both books together are $15. Send payment plus $2.00 shipping and handling to Creative Computing Press, Morris Plains, NJ 07950. Visa, MasterCard and American Express orders should include card number and expiration date. Charge card orders may also be called in toll-free to 800-631-8112 (in NJ 201-540-0445).

Order today to turn your computer into the best game player on the block.

Contents of *Basic Computer Games* (right) and *More Basic Computer Games* (below).

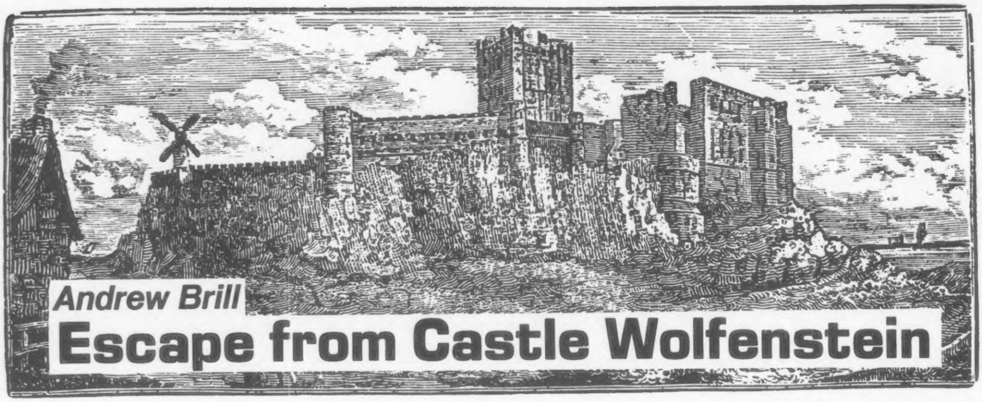
Introduction
The Basic Language
Conversion to Other Basics
Acey Ducey
Amazing
Animal
Awari
Bagels
Banner
Basketball
Batnum
Battle
Blackjack
Bombardment
Bombs Away
Bounce
Bowling
Boxing
Bug
Bullfight
Bullseye
Bunny
Buzzword
Calendar
Change
Checkers
Chemist
Chief
Chomp
Civil War
Combat
Craps
Cube
Depth Charge
Diamond
Dice
Digits
Even Wins
Flip Flop
Football
Fur Trader
Golf
Gomoko
Guess
Gunner
Hammurabi
Hangman
Hello
Hexapawn
Hi-Lo
High I-Q
Hockey
Horserace
Hurkle
Kinema
King
Letter
Life
Life For Two
Literature Quiz
Love
Lunar LEM Rocket
Master Mind
Math Dice
Mugwump
Name
Nicomachus
Nim
Number
One Check
Orbit
Pizza
Poetry
Poker
Queen
Reverse
Rock, Scissors, Paper
Roulette
Russian Roulette
Salvo
Sine Wave
Slalom
Slots
Splat
Stars
Stock Market
Super Star Trek
Synonym
Target
3-D Plot
3-D Tic-Tac-Toe
Tic Tac toe
Tower
Train
Trap
23 Matches
War
Weekday
Word

Artillery-3
Baccarat
Bible Quiz
Big 6
Binary
Blackbox
Bobstones
Bocce
Boga II
Bumbrun
Bridge-It
Camel
Chase
Chuck-A-Luck
Close Encounters
Column
Concentration
Condot
Convoy
Corral
Countdown
Cup
Dealer's Choice
Deepspace
Defuse
Dodgem
Doors
Drag
Dr. Z
Eliza
Father
Flip
Four In A Row
Geowar
Grand Prix
Guess-It
ICBM
Inkblot
Joust
Jumping Balls
Keno
L Game
Life Expectancy
Lissajous
Magic Square
Man-Eating Rabbit
Maneuvers
Mastermind
Masterbagels
Matpuzzle
Maze
Millionaire
Minotaur
Motorcycle Jump
Nomad
Not One
Obstacle
Octrix
Pasart
Pasart 2
Pinball
Rabbit Chase
Roadrace
Rotate
Safe
Scales
Schmoo
Seabattle
Seawar
Shoot
Smash
Strike 9
Tennis
Tickertape
TV Plot
Twonky
Two-to-Ten
UFO
Under & Over
Van Gam
Warfish
Word Search Puzzle
Wumpus 1
Wumpus 2

creative computing

Morris Plains, NJ 07950
Toll-free **800-631-8112**
(In NJ 201-540-0445)
CIRCLE 300 ON READER SERVICE CARD

creative computing software evaluation



Andrew Brill

Escape from Castle Wolfenstein

creative computing

SOFTWARE PROFILE

Name: Castle Wolfenstein

Type: Action/Adventure game

System: Apple II or II Plus with 48K, Applesoft ROM

Format: Disk

Language: Machine Language

Summary: Challenging and interesting game

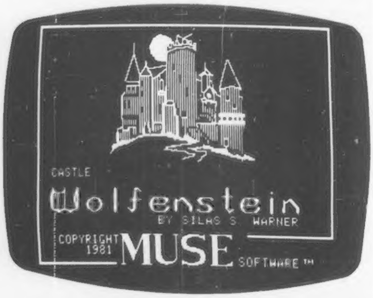
Price: $29.95

Manufacturer:
Muse Software, Inc.
330 N. Charles St.
Baltimore, MD 21201

Imagine how excited I was when, after using the Apple in the Editorial department of Creative Computing for nothing but mundane record keeping, several new games appeared on my desk for review. I began to drool as my grubby little hands booted the games for the first time. One of them, Castle Wolfenstein from Muse, has made me an addict.

After the almost endless list of tedious instructions for playing Castle Wolfenstein, an Allied prisoner shows up in the first room of a maze of adjoining rooms that is guarded by Nazi soldiers. The mission is to maneuver the Allied soldier past cruel Nazi guards and sadistic SS stormtroopers, recover the secret war plans, and escape the deadly confines of Castle Wolfenstein.

Armed with a gun loaded with ten bullets, the Allied captive attempts to kill Nazi guards who scream with piercing shrillness when shot. After shooting a Nazi, the prisoner can search him for such goodies as bullets, grenades, and door keys by standing over the dead body and pressing the space bar. However, the prisoner can take bullets from a dead guard only if the gaurd's clip contains more than the prisoner's supply. Sometimes a gaurd will surrender to the prisoner when an empty gun is pointed at him from point-blank range. Then the prisoner can search the guard and shoot him with his own ammunition.

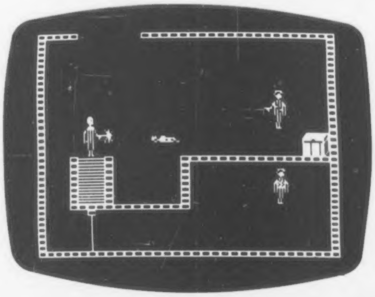


Once the pesky Nazis are eliminated from the first room, the prisoner can search the supply chests that are located in most of the rooms by pointing his gun at the chest and pressing the space bar. By pressing the 'U' key, the prisoner obtains the contents of the chest. The contents of these chests enable the prisoner to replenish depleted supplies of bullets and grenades; he may also find Nazi uniforms and bulletproof vests. Once the prisoner is wearing the uniform and vest, he can wander from room to room unnoticed by all Nazis except the SS men. The SS stormtroopers are particularly nasty because of their unrelenting and overwhelming power. They are hard to destroy, and it usually takes a direct hit from a grenade to kill them. Often, a missed attempt at killing a stormtrooper spells a quick, sure end for the Allied prisoner.

Once the prisoner has a full supply of ten bullets, three grenades, and is wearing the uniform and vest, all he needs to complete his escape are the war plans. But the road to escape is long and hard, and blocked by ruthless Nazis.

There are many pitfalls to hinder the escape of the Allied prisoner. Depleted supplies of bullets and grenades, confusing paths of escape, and frequent encounters with the seemingly unconquerable SS stormtroopers all contribute to a very low success rate.

Castle Wolfenstein is not without its annoying features. One of them is its irritating habit of disrupting the game's graphic layout when the Allied prisoner accidentally bumps into a wall. But the most frustrating feature is the length of time it takes to escape. This is due mainly to the time it takes to open the supply chests. Even more frustrating is waiting a



COLLEGE BOARD SAT PREPARATION SERIES

TRS-80, APPLE, PET, OSI, ATARI, CP/M, PDP-11

Each program confronts the user with a virtually limitless series of questions and answers. Each is based on past exams and presents material of the same level of difficulty and in the same form used in the S.A.T. Scoring is provided in accordance with the formula used by College Boards.

S.A.T., P.S.A.T., N.M.S.Q.T. — Educator Edition set includes 25 programs covering Vocabulary, Word Relationships, Reading Comprehension, Sentence Completion, and Mathematics. Price **$229.95**

Independent Tests of S.A.T. series performance show a mean total increase of 70 points in students' scores.

G.R.E. Series – Educator Edition includes 28 programs covering Vocabulary, Word Relationships, Reading Comprehension, Sentence Completion, Mathematics, Analytical Reasoning and Logical Diagrams. Price **$289.95**

COMPETENCY EXAM PREPARATION SERIES

This comprehensive set of programs consists of simulated exam modules, a thorough diagnostic package, and a complete set of instructional programs. It is designed to teach concepts and operations, provide drill and practice and assess achievement levels through pre and post testing. The Competency Exam Preparation Series provides a structured, sequential, curriculum encompassing mathematical, reading and writing instruction.

This program is designed for individual student use or use in a classroom setting. Programs provide optional printer capability covering worksheet generation and performance monitoring. C.E.P.S. are available in three software formats.

National Proficiency Series	$1,299.00
N.Y.S. Regents Competency Test, Preparation Series	$1,299.00
California Proficiency Assessment Test, Preparation Series	$1,299.00

If desired separate Mathematics and Verbal packages are available for $799.00 ea. A Spanish language version of the Mathematics Instruction Package is available at no extra charge.

INQUIRE FOR UNIQUE M.I.T. APPLE™ LOGO APPLICATIONS SOFTWARE

Time Traveler

The best of the adventure games. Confronts the player with complex decision situations and the demand for real time action. Using the Time Machine, players face a challenging series of historical environments. To succeed you must build alliances and struggle with the ruling power. Each game is unique.

$24.95

Odyssey In Time

This spectacular adventure game adds a new dimension of excitement and complexity to **Time Traveler**.

Odyssey In Time includes all the challenges of **Time Traveler** plus 10 additional eras. Each game is different and may be interrupted and saved at any point for later play.

$39.95

ODYSSEY IN TIME

SWORD OF ZEDEK

Sword of Zedek

Fight to overthrow Ra, The Master of Evil. Treachery, deceit and witchcraft must be faced in your struggles as you encounter wolves, dwarves, elves, dragons, etc. Each of the twelve treasures will enhance your power by making you invisible, invulnerable, etc. Each game is unique in this spectacular and complex world of fantasy.

$24.95

NEW

★ *MICRO-DEUTSCH* ★

Micro-Deutsch set includes 24 grammar lessons, covering all material of an introductory German course. Four test units also included. Grammar lessons use substitution transformation drills, item ordering, translations and verb drills. Drill vocabulary based on frequency lists. Suitable for use with any high school or college textbook. Extensively field tested at SUNY Stony Brook. Available for Apple II and PET/CBM. (PET version includes a special foreign language character chip.) Also available soon: MICRO-FRANCAIS, MICRO-ESPAÑOL, MICRO-IVRIT, MICRO-YIDDISH, MICRO-CHINESE, MICRO-JAPANESE. **$179.95**

☆ *NEW* ☆

☆ Pythagoras and The Dragon ☆

Mathematics in a fantasy game context. Based on **The Sword of Zedek**, **Pythagoras and The Dragon** introduces Pythagoras as a mentor to the player. When called on for aid, Pythagoras poses math questions, and depending on the speed and accuracy of the player response, confers secret information. With Pythagoras as an ally, the quest to overthrow Ra, The Master of Evil, assumes a new dimension of complexity. Depending on the level chosen, problems range from arithmetic through plane geometry.

32K **$39.95**

PROGRAMS AVAILABLE FOR
TRS-80, APPLE II, PET & ATARI

Disk or cassette, *please specify*. N.Y.S. residents add sales tax.

All programs require 16K • TRS-80 programs require LEVEL II BASIC • APPLE programs require Applesoft BASIC

Krell Software Corp.

21 Millbrook Drive, Stony Brook, NY 11790
(516) 751-5139

Escape, continued...

long time for a chest to open only to find that it contains something completely useless like sauerkraut, bratwurst, or schnapps.

Shooting bullets at a chest cuts down the amount of time it takes to open it but also diminishes the supply of bullets. You quickly learn that patience is the most important virtue when playing Castle Wolfenstein.

With a little luck and a lot of patience, you can escape from the castle. If you are lucky enough to escape with the war plans, you will definitely be promoted in rank; if you escape without the plans, you may or may not be promoted. With each escape, the layout of the castle changes and escape becomes more difficult.

The graphics of the game are simple but effective. The three different soldiers—the Allied prisoner, Nazi soldiers, and SS men—are easily distinguished from each other by their clothing. The prisoner (unless he is wearing a Nazi uniform or vest) has no distinctive markings; an ordinary Nazi soldier has a dark uniform with a stripe across it; and the powerful stormtroopers wear the ominous letters SS on their vest.

Explosions are brightly flashed on the screen to signal the demise of the prisoner and the end of the game. Escaping from the castle is depicted by the escaped prisoner triumphantly standing out on an open drawbridge with the brightened sky overhead filled with birds.

Castle Wolfenstein can be played with a joystick or paddle, or on a keyboard. The joystick allows for the easiest maneuverability, while the keyboard is the most difficult of the three controls to direct movement.

Castle Wolfenstein may be a little slow to play, but the thrill of the escape is worth the wait. Auf wiedersehn! ☐

IN A COLD CORRIDOR OF THE CASTLE, ANOTHER ALLIED SOLDIER IS INTERROGATED...
SCHWEIN-HUND.* YOU REFUSE TO COOPERATE... YOUR INSOLENCE IS USELESS...
AIEEEE!
ANOTHER ESCAPE ATTEMPT FROM CASTLE WOLFENSTEIN IS FOILED...
BUT HOURS LATER, AS DAWN BREAKS ON CASTLE WOLFENSTEIN, A SOLITARY FIGURE MAKES HIS WAY OUT OF THE FORTRESS AND TOWARD FREEDOM...

CASTLE WOLFENSTEIN™
by Silas Warner

For Apple II or Apple II Plus with 48K,
$29.95

MUSE SOFTWARE™

330 N. CHARLES STREET
BALTIMORE, MD 21201
(301) 659-7212

Apple II is a trademark of Apple Computer Corp.
© Muse Software Inc.

Call or write for information and the name of your nearest **MUSE** dealer

CIRCLE 226 ON READER SERVICE CARD

Ed Zaron: The Man from Muse

W.H. Earle

It *looks* like a computer store. The offices behind it *look* like the offices of any other small software house, awash in disks, sales handouts, and documentation manuals.

But to 39-year-old Ed Zaron, founder and president of Muse Software, his company's offices are his recording studio, and his staff a support group comparable to the roadies and sound technicians a rock group employs when it's recording an album.

And just as a rock musician's crew frees him from worrying about details so that he can concentrate on his instrument, so does the Muse staff free Zaron so that, as he explains with a laugh, "I can spend my time playing with the computer."

A computer can be anything you want.

"Playing with the computer" has taken up a major portion of Zaron's life since he first bought an Apple in February, 1978. The machine arrived just as a ten-year stint as a programmer/analyst with Commercial Credit was beginning to lose its appeal. The predictable result? Instead of spending his off-hours worrying about office problems, Zaron plunged into the task of mastering his new machine. "It got to be a routine where every single day I just came in the front door, turned the computer on, and went back to work—almost an obsession."

It was not long after the onset of that obsession that friends began asking for copies of programs Zaron had written. Sensing the opportunity that such demands represented, he began haunting computer

W.H. Earle, 4-E Springridge Court, Baltimore, MD 21207.

Zaron, continued...

shows with shopping bags full of cassettes containing games produced either by Zaron or by his Commercial Credit (and now Muse Software) associate, Silas Warner.

By the fall of 1978, that modest sales effort had left the first floor of Zaron's house littered with cassettes, duplicating gear, and shipping materials. By November it was time to hire a friend's wife to help duplicate tapes in newly rented offices and to leave Commercial Credit once and for all.

Muse's progess has been uphill ever since then—the initial staff of one now numbers 13—but it was touch and go at first. "I started the company with about $17, and for the first six months we hardly had more than that." Sales in that first year were around $10,000, but "over every four or five month period, our sales have at least doubled"—a progression that could lead to somewhere between $2.5 million and $3 million in sales in 1981.

That kind of financial action naturally involves management on Zaron's part, but he counts himself lucky that best friend Jim Black is able to handle most of the administrative work involved in managing a growing concern. That arrangement frees Zaron to spend most of his time—"day and night"—serving as the primary creative force behind Muse's growing list of highly regarded software products.

"I really love working with computers," says Zaron. "There's nothing I think about more than that. A computer can be anything you want. If you sit back and have a good idea, you can just go and *do* it on a computer. It's just the realization of *any* dream. It's tremendously creative."

Computer artists are going to be recognized in the same way that rock stars are now.

That creativity is in turn the explanation for the development of Muse's product line: "Creativity is first here, and marketing kind of follows it to help keep sales up so we can keep on being creative." Games, thus, came first because they offered the most obvious opportunity for Muse's "computer artists" to exercise their skills. Business and educational products appeared only in response to demand—and only after Zaron realized that the "elegance" he likes to cite as the hallmark of Muse software was yet another expression of the creative process.

Muse plans to continue its involvement with business and educational programs in the future, but games will continue to dominate the product line.

The development of Muse will continue to be guided by Zaron's conception of himself, his staff programmers, and the freelancers whose work Muse occasionally markets. Their creative skills determine the products the company will produce, and that fact leads to the obvious parallel between the software and music businesses: each is dominated by its artists, and each is engaged in a constant search for an unending stream of hits.

Eventually, says Zaron, "Computer artists are going to be recognized in the same way that rock stars are now. Everything they do is just so personal. What kind of experience can somebody take you through? They can take you through a music experience, or they can take you through an experience on your computer. Just as, if you listen to any John Lennon album, you hear his rhythm in there, I think if you look at any program by the same guy, you hear his rhythm in there."

The analogy has its limits, of course: Zaron doesn't plan to start doing concerts on tour any time soon, and *Creative Computing* isn't ready to run a Top Ten just yet.

But if you some day run across a diskette titled *Muse's Golden Oldies*, you'll know who's at the keyboard. ☐

Ed Zaron of MUSE Software

Former Real World Programmer Makes Good in Computer Software Business

Less-than-outstanding public relations photo from understaffed PR department who have more profitable things to worry about.

Wilting plants show effects of unsuccessful runs of "Three Mile Island."

Sunglasses to shield eyes from glare of continuous playing of Robotwar on CRT screen.

Big smile resulting from big profits from "Castle Wolfenstein."

DieHard battery for instant computer power to "The Voice" in case of brownout.

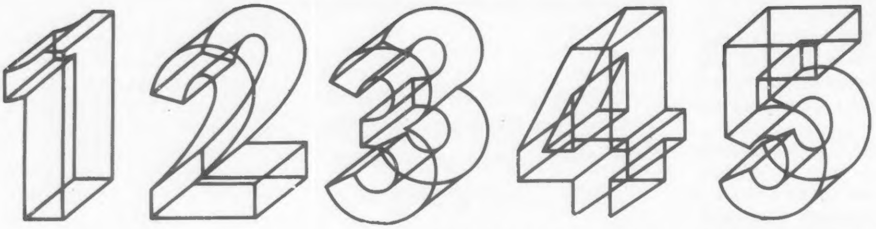
Slightly rumpled, macho look makes it big in downtown Baltimore software industry.

Vending machine coffee (and refill) to steady nerves after 20-hour bout with "ABM."

Panoramic view from penthouse suite of MUSE Software Building.

Wrench and pliers in pencil cup for immediate repair of balky computer keyboards.

"White out" to make last-minute corrections on software manuals not produced by "Super-Text."



Five for the Vic20

David Lubar

In many cases, the first release of software for a new computer is of the "so what?" variety; there are hangmen aplenty, unlimited variations of nim, and rehashes of teletype-oriented games from ages ago. Let us pause and praise Commodore for knowing better. The first batch of VIC software is here, and it looks pretty good. They supplied us with four games and one personal utility. The games range from fair to very good, and the personal utility is useful if you need a quick graph of your biorhythms. Only two of the programs bear any hint of the early-release syndrome.

$50 Deductible

Modeled after a popular arcade game, *Car Chase* was the best game of the lot. The player moves through a course of concentric rectangles, attempting to drive over a series of dots while avoiding head-on collisions with a computer-controlled vehicle. There is an opening on each side of each rectangle, allowing the player's car (and the chase car) to change lanes. The chase car is endowed with unerring accuracy, and capitalizes on any mistake the player makes. Balancing this, the player has three chances per game. Four keys are used to control the car; "A" accelerates, "D" decelerates, "J" is used for moving inward, and "K" is used for moving outward. This arrangement works well once one gets used to it.

If the player succeeds in clearing the screen of dots, he gets a new screen. This process continues until the third collision. At this point, the program displays the most recent score, and the highest score achieved by the player. A press of the space bar starts the game again. *Car Chase* is fun, challenging, and a good omen for the future of the VIC.

For Goodness Snake

Slither and *Super Slither* are two games on another VIC cassette. *Slither* puts the player in control of a snake with an appetite for numbered squares. The player guides the snake around the screen, using the "I," "J," "K," and "M" keys to move up, left, right, and down. The game lasts for sixty seconds. During this time, boxes appear at random locations on the screen. The object is for the snake to collide with the box, while avoiding any collision with the wall or his own body. Each box contains a number, from one to nine, representing a point value. Every time the snake scores points, it grows an extra segment, increasing the danger that the head will hit the body. Only one box appears on the screen at a time, and the boxes only last for a certain amount of time before disappearing.

Super Slither expands on the above game in two ways. First, up to three boxes can be on the screen at any one time. Second, instead of gaining one segment for every box, the snake gains a segment for every point. When the player's score reaches the forties or fifties, maneuvering can become a bit tricky. The only disadvantage with this package is that the two games must be loaded separately. It would be nice if they had been combined, allowing the user to switch between games without stopping to load a program. Aside from this, the games are quite good, and will appeal especially to the younger members of the VIC community.

Busted Again

While *Casino-Style Blackjack* is a vestige of the early days of computer software, this VIC version is well done, incorporating all the features of the game except for insurance bets. Designed for one or two players, with the VIC as the house, the game is a good buy for the casino lover who lives far from Atlantic City or Las Vegas.

Octopus Wanted

Blue Meanies from Outer Space was the one weak game of the group. The player uses six lasers, controlled by six keys, to shoot at the Blue Meanies as they drop from the sky. If a Meanie hits the ground, he destroys a small square area. If enough of the ground is destroyed, the base is overrun and the player loses. The ground can be repaired using a robot which is controlled with five more keys. This combination leaves one in danger of permanently interlaced fingers.

If the player survives the first twenty Meanies, the attack begins anew with meaner Meanies. The player is given a certain amount of energy. When this runs out, he can't shoot. Since the VIC, like the PET, seems to buffer keyboard input, a keypress while power is down can result in a shot from the laser when power is restored. This usually happens after the Meanie has moved past the laser, and can be a touch frustrating. While there is nothing really bad about the game (our summer campers loved it), Blue Meanies just doesn't compare well to the other releases.

In the Mood

Biorhythm Compatibility draws a graph of a person's physical, emotional, and intellectual cycles, displays critical days, and can predict the compatibility of any two people whose birthdates are entered. As with blackjack, the biorhythm program is old stuff though well executed. While opinions vary as to the validity of biorhythms, the program is ideal for parties and other gatherings of humans in need of something to do.

Summing It Up

The early VIC line was obviously not rushed to market. The games are filled with error traps that won't allow bad input. The first improvement Commodore should make is better documentation. Each game is accompanied with a single sheet which, though it explains the game, is more a summary than full instructions, leaving the user to discover the fine points through trial and error. Beyond this, the first release of VIC software is nothing but good news for VIC owners. The tapes are available for a suggested retail price of $14.95 each. The five reviewed above, along with another program, are also available in a six pack retailing for $59.95.

The Future

A discussion with Commodore revealed ambitious plans for further software releases. The next six pack of tapes will include programs for personal finance, home inventory, and line-oriented word processing. For recreation, there will five cartridges with Scott Adams Adventures, and one with the popular *Sargon* chess program. In the arcade area, releases will include *Vic Avenger*, *Super Lander*, and *Super Alien*. Planned utilities include *VIC-MON* with machine language aids and *Programmer's Aid* for Basic. Finally, to gladden the heart of old Trekkies, Commodore has selected William Shatner to be their commercial spokesman for the VIC.

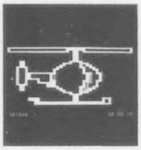
Commodore Business Machines, Inc. is located at 950 Rittenhouse Rd., Norristown, Pa. 19403. ☐

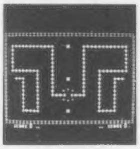
Fast interactive debugging of APPLESOFT™ programs

SOFT-STEP™ — a new easy-to-use debugger for the expert and beginner alike. Some of its outstanding features:

STEP—single-step thru your BASIC programs
BREAK—set breakpoint at any line
LIST—list next line to be executed
TRACE—trace all or only chosen lines
EXAMINE—see the values of variables or memory
DEFINE—change values of variables or memory

Requires 32K APPLE (only 2.7 kbytes long). No modification to your source program needed. Fast Assembly language. $39.95. See your dealer today





LOOP-HOLE™ — a fast, fun, hi-res action game for two. You win by trapping your opponent in your trail—if his bullets don't get you. Play with game paddles or keyboard commands. $29.95

ACCU-SHAPES™ — the ultimate shape-building program. Shapes are constructed on the lo-res screen with simple keyboard commands to unparalleled accuracy. Save tables to disk. Add, delete, insert, edit, move, etc., at will. Construct on lo-res, view on hi-res. Fast 8K Assembly language. 48K APPLE required. $39.95. See your dealer today.

ACCENT Software
3750 Wright Place
Palo Alto, CA 94306
(415) 856-6505

APPLESOFT and APPLE are trademarks of Apple Computer

CIRCLE 106 ON READER SERVICE CARD

WANTED

SOFTWARE AUTHORS!

for Apple, Atari, TRS-80, NEC, Hitachi. . . .

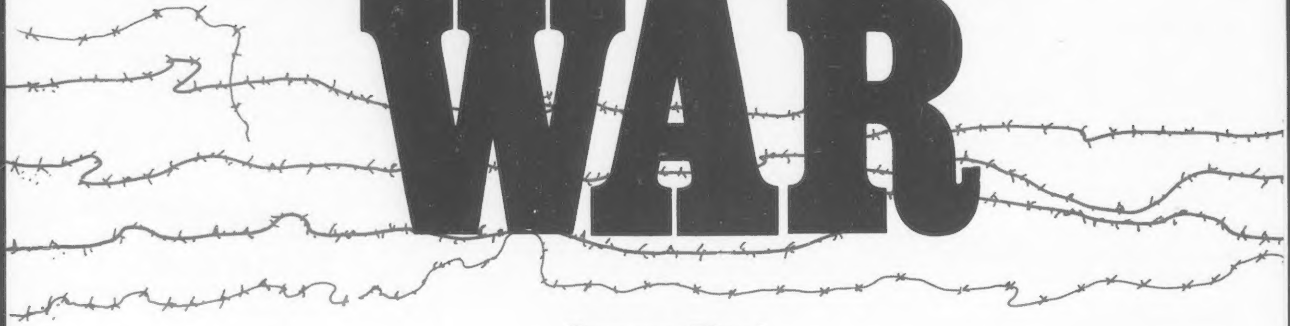
Brøderbund Software is looking for new authors to join its international team of programmers. If you have a product for the micro market, let us show you the advantages of working with our team of design, production and distribution specialists.

Call or write for our free Authors Kit today or send us a machine readable copy of your work for prompt review under strictest confidence.

Brøderbund Software
2 Vista Wood Way San Rafeal, CA 94901 (415)456-6424

CIRCLE 264 ON READER SERVICE CARD

THE ATARI GOES TO WAR



George Blank

creative computing
SOFTWARE PROFILE

Name: Eastern Front
Type: War Game
System: Atari 400 or 800
Format: Cassette, Disk, MicroNet download
Language: Machine
Summary: Outstanding Computer War Game
Price: $23.25 to $29.95
Manufacturer:
Atari Program Exchange
P.O. Box 427
Sunnyvale, CA 94086

Why would a multimillionaire ex-movie star seek a job as President of the United States with a salary of a mere $200,000 a year, or the head of a major corporation join the Cabinet with a salary even lower? The answer is that of all the success drives that captivate the human imagination, the strongest is the lust for power. Power is far headier than sex, wealth, or fame, and may make the others easier to obtain.

No exercise of power can compare with the job of a commanding general in time of war, marshaling millions of soldiers and the industrial resources of many nations in an all-out drive for supremacy on a battlefield that covers a continent. One of the largest such campaigns in human history was Operation Barbarossa, the German invasion of Russia that began in the summer of 1941. During the course of this four year campaign, nearly 20 million human lives were lost. Eastern Front, one of the best microcomputer war games ever produced, allows the player to take on the role of the commander of the German army, and try to do better than the German forces actually did.

Nearly every aspect of the game is a technical masterpiece.

In the past, among war games, board games have had a major advantage over computer games. War gamers like to operate on a theatre level, with an overview of dozens or even hundreds of units scattered over a wide area. Until now the limitations of computer displays have made it difficult to get a satisfying situation map.

Special Features

In Eastern Front, Chris Crawford has produced the first really satisfactory solution to the display problem by using the fast fine-scrolling ability of the Atari computer to produce a magnificent map of Eastern Russia that occupies ten display screens.

Nearly every aspect of the game is a technical masterpiece. Eighteen colors are used on the screen at a time. Player missile graphics are used to move a cursor over the map to give instructions without disturbing the map underneath. Several different redefined character sets permit the natural mixing of a colorful and detailed terrain with a text display. Display list interrupts are used to set the weather conditions, with ice gradually taking over the rivers in winter and receding in the spring, and making the player deal with mud and snow at different times in different areas.

The program uses intricate artificial intelligence routines and multiprocessing to control the Russians and their allies. This means that the longer the German player takes to form his strategy, the better the Russian strategy will be. The Russian side can analyze its position, recognize danger and opportunity, avoid traffic jams, recognize the effects of terrain, and plan accordingly.

Atari SOFTWARE

Air Traffic Controller

In this popular, fast-moving simulation you must successfully control the flight paths of 27 aircraft as they take off, land and fly over your airspace. You give orders to change altitude, turn, maintain a holding pattern, approach and land at two airports. With five different airport configurations and variable skill levels, you won't easily tire of this absorbing and instructive simulation. Cassette CS-7004 $14.95.

Original Adventure

Only the brave enter the Colossal Cave, and only the clever survive. The entire evil cast of this classic game, from deadly dragon to nasty dwarf, will try to stop your quest for treasures. Using English commands, you explore the cave, travel through more than 100 locations, gather treasures, and attempt to think your way out of dangerous situations. Every aspect of the game is faithfully reproduced from the Original Adventure born on large computer systems. For weary travelers, there is even a SAVE GAME feature. Add this classic to your software collection. Order CS-7504 for disk $24.95, CS-7009 for cassette $19.95.

*Dominoes

Take on your computer at a game of draw dominoes. With options for repeating or alternating draw, **Dominoes** gives the game player a tough opponent who's always ready. From Thorn/EMI. Order cassette CS-7007. $11.95.

*Cribbage

Can you be the first to peg twice around the board? Your computer will put up a tough fight in this head-to-head game of cribbage. A graphic display of board and cards highlight this game of skill. From Thorn/EMI. Order cassette CS-7008. $11.95.

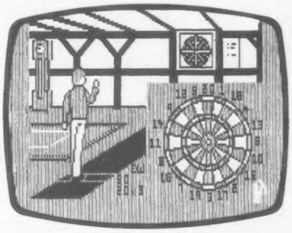
*Tilt

A favorite craze for years, the familiar wood labyrinth that tilts in all directions has entered the computer age. One or two players attempt to navigate balls through a maze and into scoring holes. With nine skill levels and nine speeds, **Tilt** will provide hours of fun. And, since each player can use a different skill level, **Tilt** is ideal for family play. From Thorn/EMI. Order cassette CS-7013 $11.95.

*Pool

Put a games room in your computer. Old pros and beginners alike will thrill to the challenge and realism of **Pool**. From the satisfying click of a tough combination shot to the acccuracy required for a three-cushion bank, **Pool** has it all. You control the angle and force of your stroke, then watch the object ball speed toward the pocket. It's so real you can almost feel the felt.

There is a practice mode for one player, and 8-Ball and Tournament Pool for two. Take a break with **Pool** today. From Thorn/EMI. Order cassette CS-7010 $14.95.



*Darts

Enter the pub, grab a pint of lager and a handful of darts, then try for a bull's eye in this amazing graphic game. One or two players can go at it, testing their aim at ten skill levels. Whether you want to throw a few, or just show your friends what the Atari computer can do, **Darts** is an ideal addition to your software library. This is Britain's most popular Atari game from Thorn/EMI. Order cassette CS-7011 $14.95.

*Billiards

This captivating British game is played with three balls on a standard pool table. Each player attempts to score by sinking a shot or hitting two balls with his cueball. From Thorn/EMI. Order cassette CS-7012 $14.95.

*Snooker

A tough British Game using 26 balls requiring the eye of sharpshooter and the strategy of a chess master. From Thorn/EMI. Not available on cassette.

Atari is a registered trademark of Atari, Inc.

Trucker

This program simulates coast-to-coast trips by an independent trucker hauling various cargos.

If all goes well, you can obey the speed limits, stop for eight hours of sleep each night and still meet the schedule. Bad weather, road construction or flat tires may put you behind schedule. You may try to increase your profit by skimping on sleep, driving fast or carrying an overweight load. Not available on cassette.

Streets of the City

During your tenure, you must construct streets and Interstate highways, repair existing streets, and improve traffic safety. For the Transit Authority you have to upgrade and replace a delapidated bus fleet, increase ridership, reduce maintenance downtime and improve on-schedule performance. Not available on cassette.

Outdoor Games

Fight a raging inferno in Forest Fire. User options allow for endless variety and skill levels. When the fire is out, relax with Fishing Trip, but watch out for sharks. The brave may wish to trek through the wilderness in Treasure Island I and II. Beware the sentinels—they're after you. Order cassette CS-7002 $11.95.

Haunted House

You are trapped in a mansion, alone except for the spirits that haunt the place eternally. Can you find the exit before midnight? This ever-changing game, complete with sound effects, is a perfect companion for dark evenings and rainy days. Order cassette CS-7003 $11.95.

Disk Packages

Pool, Snooker Billiards	CS-7509	$24.95
Darts and Tilt	CS-7506	$24.95
Dominoes and Cribbage	CS-7507	$19.95
Outdoor Games and Haunted House	CS-7502	$19.95
Trucker and Streets	CS-7707	$24.95

Order Today

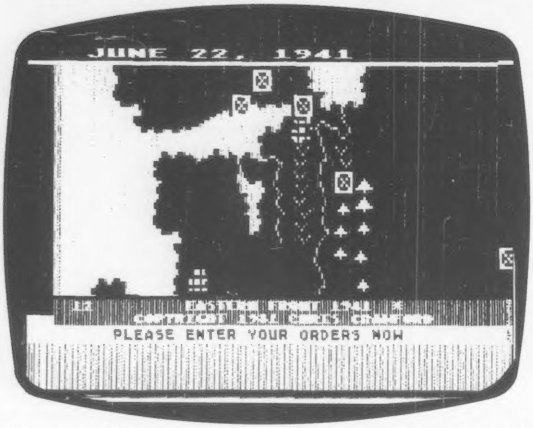
To order any of these software packages send payment plus $2.00 postage and handling per order to Creative Computing, Morris Plains, NJ 07950. Visa, MasterCard and American Express orders may be called in toll-free.

Order today at no risk. If you are not completely satisfied, your money will be promptly and courteously refunded.

creative
computing
software

Morris Plains, NJ 07950
Toll-free **800-631-8112**
(in NJ 201-540-0445)

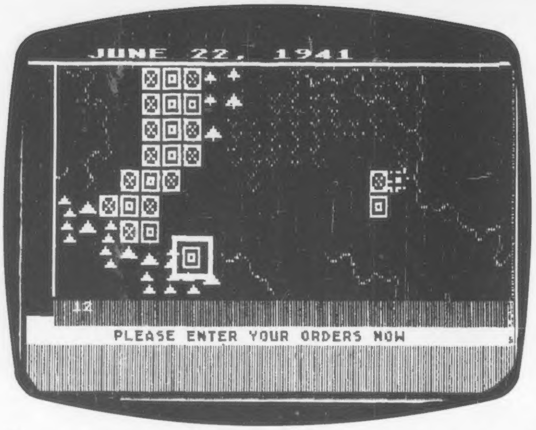
* Licensed from Thorn/EMI Video Programmes Ltd. Available in North America only.



JUNE 22, 1941

PLEASE ENTER YOUR ORDERS NOW

Figure 1. The opening display of Eastern Front shows the Baltic Sea, with two Finnish Infantry Units (German Allies) in Finland and three Russian infantry units. This black and white picture does not distinguish between the units, but the Russians are red and the Axis are white. The city in the top center of the screen, directly below a Russian unit, is Leningrad.



JUNE 22, 1941

PLEASE ENTER YOUR ORDERS NOW

Figure 2. German and Russian units face each other in Central Poland. This display shows mountains, rivers, forests, marshes, and the city of Kiev, along with Russian and German Infantry and Armor units. The cursor is over a Russian Unit. Pressing the button would cause the unit to disappear, identifying the terrain underneath, and also display information on the unit; in this case, the 4th Russian Tank Army, a weak unit with a muster level of 79 and a current strength of 77.

The human engineering of the game is also a major accomplishment, with all information entered by the player using only the joystick, trigger button, start button, and space bar. This eliminates the drudgery of most war gaming. The multiprocessing even allows the German player to move the cursor around and view different sections of the map while the battles are taking place. Of course, since all battles and movement are real time, it is impossible to see everything that is happening. Excellent sound effects do indicate the extent of the overall action.

The computer adds a great deal to wargaming, particularly by providing a dynamic environment in place of the static nature of board games. Each turn, representing one week of actual time, is broken down into 32 time periods in which units move and fight. Thus a player might program a particular unit to attack an adjacent enemy unit and move toward a city. During the course of a single turn, that unit might destroy the first enemy unit, move forward to engage a unit behind it, force the second enemy to retreat, turn toward the city, and engage in battle a third enemy unit that has come up from the reserves during the turn. Terrain affects both movement and combat, with rivers, forests, marshes, mountians, and cities to complicate strategy.

Playing the Game

At the beginning of the game the German commander has the advantages of concentrated force, short supply lines and superior mobility. However, the Russians have overwhelming numbers, vast territory, and the Russian winter on their side. The object of the game for the German commander is to push as large a force as possible as far East as possible and maintain them. Extra points are awarded for capturing key Russian cities. The Russians are trying to move their forces West, which also affects the German player's score. The score, which is calculated from week to week, can range from 0 to 255 points. It is fairly easy to get a high score by early fall, but nearly impossible to hold that advantage over the winter.

During the war, large concentrations of German troops were bogged down in the Pripet marshes between Minsk and Kiev, allowing the Russians to concentrate their forces. This is a recipe for disaster in the game, as it was also a German

Eastern Front, continued...

disaster in real life. My own best strategies have involved splitting up my forces to prevent the Russians from concentrating theirs, and avoiding combat with superior mobility unless I had overwhelming superiority. Another possibility might be to crash through the Pripet marshes and break into open territory beyond, splitting forces at that time. Uncertain winter supply lines require that the German player draw back during that season.

Regardless of my strategy, my success rate in my first ten games was abysmal. The game ends automatically after the week of March 29, 1942, and in nine of my games my score was 0 on that date. In the one game where I held a score to the end, I seized the city of Leningrad (worth 10 points) and defended it to practically my last man. My total score was 10 points.

After many hours of play, I found only a few real weaknesses. Giving all those instructions with the joystick can give you a sore palm and wrist. The lack of a clearcut set of victory conditions is frustrating, as is the overwhelming advantage of the Russians. I would also like an option to be able to see the whole theatre at once, however limited the detail might be at that time. The designer mentions in the instructions that test players became frustrated with random logistics problems and traffic jams, but I tend to think these are realistically handled.

I have no hesitation in calling this one of the very best war games available for a personal computer.

Recommendation

I have no hesitation in calling this one of the very best war games available for a personal computer. It is also a virtuoso demonstration of the awesome built-in capabilities of the Atari computer. This game literally could not be done on any other computer in as satisfactory an execution. By all means, if you are at all interested in strategy games, buy it.

If you are a serious war gamer, buy it even if you have to buy a computer in order to run it. Eastern Front comes on disk, requiring 32K of RAM, for $29.95. It is also available on cassette, requiring 16K of RAM, for $26.95. The cassette version can be downloaded from Micro-Net at a price of $23.25. ☐

Special editions for Apple, Atari and TRS-80 Computers.

Programming is
Child's Play

Hey kids, are the folks out of the room? Good, 'cause I've got a secret to tell you. You know that computer they fuss over? Well, kid, between you and me, this whole programming thing is a lot simpler than they realize.

What's that? Sure, you can learn. Just get a copy of **Computers For Kids.** It's a super book, and it tells you everything you need to know. Huh? You have an Apple? No problem. There's a version just for the Apple. One for the TRS-80 and one for the Atari too, with complete instructions for operating and programming.

The book will take you through everything programmers learn. Its easy to understand and the large type makes it easy to read. You'll find out how to put together a flowchart, and how to get your computer to do what you want it to do. There's a lot to learn, but **Computers For Kids** has 12 chapters full of information. You'll even learn how to write your own games and draw pictures that move.

Just so the folks and your teachers won't feel left out, there's a special section for them. It gives detailed lesson ideas and tells them how to fix a lot of the small problems that might pop up. Hey, this book is just right for you. But you don't have to take my word on that. Just listen to what these top educators have to say about it:

Donald T. Piele, Professor of Mathematics at the University of Wisconsin-Parkside says, "**Computers For Kids** is the best material available for introducing students to their new computer. It is a perfect tool for teachers who are learning about computers and programming *with* their students. Highly recommended."

Robert Taylor, Director of the Program in Computing and Education at Teachers College, Columbia University states, "it's a good idea to have a book *for chidren*."

Not bad, huh? Okay, you can let the adults back in the room. Don't forget to tell them **Computers For Kids** by Sally Greenwood Larsen cost only $3.95. And tell them you might share it with them, if they're good. Specify edition on your order: TRS-80 (12H); Apple (12G); Atari (12J).

Your local computer shop should carry **Computers For Kids**. If they don't ask them to get it or order by mail. Send $3.95 payment plus $2.00 for one, $3.00 for two or more for shipping and handling to Creative Computing Press, P.O. Box 789-M, Morristown, NJ 0796C.

creative computing press

CIRCLE 350 ON READER SERVICE CARD

Expanding Your TRS-80 Model I

Alternatives to the Radio Shack TRS-80 Expansion Interface

If you are considering memory expansion, floppy interface, serial I/O, etc. for your TRS-80 read on.

Exatron MM+

Harley Dyk

If you own a 16K Level II TRS-80 Model I, you own a very cost effective computer. This does not necessarily mean, however, that you are content with your computer. If you are a programmer you are aware that programs often grow to fill (or exceed) available memory. If you are a serious user of your system you probably long to add a disk drive or alternative, such as the Stringy Floppy or the Beta-80. In either case you may need more memory and/or a floppy controller.

The MM+ (memory plus interface) by Exatron and the System Expansion by LNW Research provide quality alternatives to the Radio Shack Expansion Interface and either could save you some money depending on your needs.

MM+

The MM+ has just been introduced by Exatron (the Stringy Floppy company). The unit comes assembled and is made to fit under the TRS-80 monitor. Standard features are: 32K of memory, built-in power supply, parallel printer port (Radio Shack/Centronics compatible), serial printer port (RS-232C), light pen port, real-time clock, and general parallel port (IBM Model 50 compatible). The unit was designed with Stringy Floppy owners in mind, and this accounts for the fact that a floppy controller was not included as a standard feature.

The MM+ has room for an additional board and its power supplies run at or under 50% capacity. An additional 32K (bank 2) and floppy controller will be the first options available on the second board. Exatron is polling its Stringy Floppy owners to find what other options they would like to have available on the second board. The company plans to work on the options in order of preference indicated by their customers. Some of the other things under consideration are: color graphics, hard disk controller, RS-232C serial I/O, IBM Model 50 bidirectional interface (use typewriter keyboard), multi-port parallel I/O, A/D and D/A interface, TRIAC/SSR/OPTO-Isolater control interface, port FF audio output circuit (for sound effects), IEEE-488 Interface, and a communications modem.

A unique feature of the MM+ is the light pen port. This port is designed for use with the "Photopoint" light pen made by MicroMatrix. The light pen can be used with a cassette recorder serving as an amplifier, but the light pen port makes the amplifier more convenient and leaves the recorder free. The port should work with any light pen that normally connects to the Radio Shack cassette recorder.

The MM+ is guaranteed to run at double CPU speed (3.55 MHz). This makes the MM+ compatible with the TRS-80 speed-up kit offered by Exatron.

The Memory + Interface (MM+) by Exatron.

Harley Dyk, 1644 Grant, Grand Haven, MI 49417.

DISK III

100% Compatible

Model III Disks

Complete Business System includes: 48K TRS-80™ Model III, Disk III™ 2 Drive System, TRSDOS and Manual.

$1882

DISK III single drive assembly includes: one 40 track 5¼" double density drive, power supply, controller, mounting hardware, and applicable cables.

DISK III Single drive assy[1]	**$599.00**
DISK III Two drive assy	**864.00**
DISK III Assy w/out drives	**435.00**
TRSDOS™ & Manual	**21.90**
External drives (3 & 4)	**299.00**

IMMEDIATE DELIVERY - COMPARE AND SAVE

WINCHESTER HARD DISK MODEL III

Integral Winchester Business system includes: 48K Model III, LDOS Disk III™, 6.3 MEG HARD DISK SYSTEM.

$4995

$2895

6.3 MEGABYTE WINCHESTER HARD DISK SUBSYSTEM With chassis, PS, LDOS™.
9.5 MEG $3395.00

MOD III Options:	
9.5 MEG HD (internal)	add $500.00
80 tk 1 side floppy	add $120.00
80 tk 2 side floppy	add $240.00

Winchester Subsystem Options:	
2 x 6.3 Meg drives	4495.00
2 x 9.5 Meg drives	5495.00

Peripherals	
Epson MX-80	500.00
Epson MX-80 FT	615.00
Epson MX-100	800.00
Centronics 739	700.00
Starwriter 25 (P)	1395.00
RS-232	95.00
Lexicon modem	105.00

MODEL I/III EXTERNAL DRIVE W/ PS & ENC **$275**

Fully Compatible
120 day warranty
Easy installation

80 tk or 2 sided	$419.00
80 tk & 2 sided	549.00

OTHER PRODUCTS	
SUPERBRAIN 64K	2990.00
PARALLEL PORT — SUPERBRAIN	99.95
DISK & MYSTERIES	22.50
BASIC & MYSTERIES	29.95
NEC Ribbons (min. 6)	5.95
Epson Ribbons	12.50
NEW—	
LDOS Operating System	149.00

COMING SOON!!
Internal MODEM for MOD III

IF YOU DON'T SEE IT ADVERTISED CALL US AND ASK FOR IT.
PUBLISHED PRICES REFLECT CASH DISCOUNT.
ALL PRICES ARE SUBJECT TO CHANGE WITHOUT NOTICE.
TRS-80 and TRSDOS are trademarks of Tandy Corp.
DISK III is a trademark of VR Data Corp. Dealership available.

Phone toll free 800-345-8102
• in PA 215-461-5300 Cable address "VRDATA" • TELEX

VR Data
VR Data Corporation
777 Henderson Boulevard • Folcroft, PA 19032

master charge VISA

CIRCLE 340 ON READER SERVICE CARD

	MM+	LNW
Size	17" x 7" x 3"	10" x 12" x 3" (in LMB 10123 chassis)
State	Assembled only	Bare board only
Cost	$399	$270-$300 including power supply and 32K
Memory	32K only	16K or 32K
Floppy Interface	No (but an option soon)	Add $50 plus cable
Real-Time Clock	Yes (can use with Level III Basic)	Add $4
Serial I/O	Printer output only (300 and 600 baud)	Add $22
Parallel printer port	Yes	Add $3
Dual cassette port	No	Add $10
Light pen port	Yes	No
Bus extender	Yes	Yes
On-board power supply	Yes	Yes (minus transformer)
Dealers	No, mail-order order through program chairman (active Stringy Floppy owner)	None established, however some dealers may stock this board, otherwise mail-order
Warranty	Year/30-day money-back	90 days (board only)
Toll free number	Yes	No
Contact	Exatron 181 Commercial St. Sunnyvale, CA 94086 800-538-8559	LNW Research 8 Hollowglen St. Irvine, CA 92714
Misc.	Guaranteed to run at 3.55 MHz, has memory bank select circuit so can add another 32K, has on-board memory-mapped address decoding.	Prices of options above are accurate only if built in the order listed. Any other order could change prices since parts are shared in many sections.

Table 1.

Comparisons

The key to selecting one of the two expansions lies in the answers to the following important questions. Do you want to build your expansion unit? Do you need a floppy interface immediately? Do you need serial I/O now? (The MM+ has output only at this time.) Do the additional features being considered for the MM+ interest you? These questions address the basic differences between the two units. Table 1 can also help you compare the major features at a glance.

Both units have performed well for many users. Both work well with disk alternatives such as the String Floppy and Beta-80. Both units are of top quality and are produced by reputable companies. At a minimum, either unit should fix your OM errors and provide many additional features.

The LNW System Expansion

Richard Zatarga

This article addresses those computerists who are ambitious, industrious, and capable of reading a schematic diagram; possess a better than average ability to use a soldering iron; and have a desire to upgrade a TRS-80 Model I computer and save over $100 in the process.

The above mouthful may sound like science fiction, however, if I have just described you and you are willing to spend a few—well actually, quite a few—evenings with iron and solder in hand, you can have an Expansion Interface for two-thirds of Radio Shack's price, and with a serial RS-232C/20mA interface thrown in as a bonus.

"Sounds too easy!" "What's the catch?" you ask. Well read on and I'll tell you how I did it. First, I parted with $69.95 plus $3.00 for shipping and handling for the LNW Research System Expansion printed circuit board. Please note that this is a bare P.C. board. What you are paying over $70 for is a meticulously traced and silk screened epoxy circuit board and LNW's electronic expertise.

Ten days after I placed my order for the P.C. board, UPS delivered the board and the assembly/user manual. After opening the box, I inspected the board for damage. The board was fine, but what I noticed during the inspection was the very tight and dense component layout. I've built a few electronic kits in my day from a simple speaker system to a complex color television, but I had never run across a you-build-it circuit as tightly packed as the System Expansion. This project is definitely not—I repeat, *not*—for the novice solder jockey or the sweat solder expert who works with copper tubing and a propane torch. Construction of this unit requires time, patience and precision.

With the board inspected, I sat down in my favorite easy chair and began to read the manual. Quickly thumbing through its 67 typewritten pages, I was initially impressed. However, after reading it thoroughly from cover to cover, I found the manual to be a bit of a disappointment due to the lack of detail, especially in sections on assembly, testing and trouble-shooting.

The next thing I did was to collect all of my electronic component catalogs and a few back issues of some computer

---

Richard Zatarga, 800 Towner Swamp Rd., Guilford, CT 06437.

4MHZ, DOUBLE DENSITY,COLOR&B/W GRAPHICS . .THE LNW80 COMPUTER

LNW RESEARCH

COMPARE THE FEATURES AND PERFORMANCE

FEATURES	LNW80	PMC-80**	TRS-80* MODEL III
PROCESSOR	4.0 MHZ	1,8 MHZ	2.0 MHZ
LEVEL II BASIC INTERP.	YES	YES	LEVEL III BASIC
TRS80 MODEL 1 LEVEL II COMPATIBLE	YES	YES	NO
48K BYTES RAM	YES	YES	YES
CASSETTE BAUD RATE	500/1000	500	500/1500
FLOPPY DISK CONTROLLER	SINGLE/ DOUBLE	SINGLE	SINGLE/ DOUBLE
SERIAL RS232 PORT	YES	YES	YES
PRINTER PORT	YES	YES	YES
REAL TIME CLOCK	YES	YES	YES
24 X 80 CHARACTERS	YES	NO	NO
VIDEO MONITOR	YES	YES	YES
UPPER AND LOWER CASE	YES	OPTIONAL	YES
REVERSE VIDEO	YES	NO	NO
KEYBOARD	63 KEY	53 KEY	53 KEY
NUMERIC KEY PAD	YES	NO	YES
B/W GRAPHICS, 128 X 48	YES	YES	YES
HI-RESOLUTION B/W GRAPHICS, 480 X 192	YES	NO	NO
HI-RESOLUTION COLOR GRAPHICS (NTSC), 128 X 192 IN 8 COLORS	YES	NO	NO
HI-RESOLUTION COLOR GRAPHICS (RGB), 384 X 192 IN 8 COLORS	OPTIONAL	NO	NO
WARRANTY	6 MONTHS	90 DAYS	90 DAYS
TOTAL SYSTEM PRICE	$1,914.00	$1,840.00	$2,187.00
LESS MONITOR AND DISK DRIVE	$1,450.00	$1,375.00	---

When you've compared the features of an LNW80 Computer, you'll quickly understand why the LNW80 is the ultimate TRS80 software compatible system. LNW RESEARCH offers the most complete microcomputer system at an outstanding low price.
We back up our product with an unconventional 6 month warranty and a 10 days full refund policy, less shipping charges.

LNW80 Computer	$1,450.00
LNW80 Computer w/B&W Monitor & one 5" Drive	$1,914.00

All orders must be prepaid, CA residents please include 6% sales tax.
Contact us for shipping charges

* TRS80 Product of Tandy Corporation.
** PMC Product of Personal Microcomputer, Inc.

LNW80

- BARE PRINTED CIRCUIT BOARD & MANUAL $89.95

The LNW80 - A high-speed color computer totally compatible with the TRS-80*. The LNW80 gives you the edge in satisfying your computation needs in business, scientific and personal computation. With performance of 4 MHz, Z80A CPU, you'll achieve performance of over twice the processing speed of a TRS-80*. This means you'll get the performance that is comparable to the most expensive microcomputer with the compatibility to the world's most popular computer (TRS-80*) resulting in the widest software base.

FEATURES:
- TRS-80 Model 1 Level II Software Compatible
- High Resolution Graphics
  - RGB Output - 384 x 192 in 8 Colors
  - NTSC Video or RF MOD - 128 x 192 in 8 Colors
  - Black and White - 480 x 192
- 4 MHz CPU
- 500/1000 Baud Cassette
- Upper and Lower Case
- 16K Bytes RAM, 12K Bytes ROM
- Solder Masked and Silkscreened

LNW SYSTEM EXPANSION

- BARE PRINTED CIRCUIT BOARD AND MANUAL	$69.95
WITH GOLD CONNECTORS	$84.95

The System Expansion will allow you to expand your LNW80, TRS-80*, or PMC-80** to a complete computer system that is still totally software compatible with the TRS-80* Model 1 Level II.

FEATURES:
- 32K Bytes Memory
- 5" Floppy Controller
- Serial RS232 20ma I/O
- Parallel Printer
- Real Time Clock
- Screen Printer Bus
- On Board Power Supply
- Solder Masked and Silkscreened

LNDoubler & DOS PLUS 3.3D

- Assembled and Tested W/DOS PLUS 3.3D..............$175.00

Double-density disk storage for the LNW Research's "System Expansion" or the Tandy's "Expansion Interface". The LNDoubler™ is totally software compatible with any double density software generated for the Percom's Doubler***. The LNDoubler™ provides the following outstanding features.

- Store up to 350K bytes on a single 5" disk
- Single and double density data separation
- Precision write precompensation circuit
- Software switch between single and double density
- Easy plug in installation requiring no etch cuts, jumpers or soldering
- 35, 40, 77, 80 track 5" disk operation
- 120 day parts and labor Warranty

*** Doubler is a product of Percom Data Company, Inc.

DOS PLUS 3.3D

Micro Systems software's double density disk operating system. This operating system contains all the outstanding features of a well developed DOS, with ease in useability.

KEYBOARD

LNW80 KEYBOARD KIT $84.95

The Keyboard Kit contains a 63 key plus a 10 key, P.C. board, and remaining components.

CASE

LNW80 CASE $84.95

The streamline design of this metal case will house the LNW80, LWN System Expansion, LNW80 Keyboard, power supply and fan, LNDoubler™, or LNW Data Separator. This kit includes all the hardware to mount all of the above. Add $12.00 for shipping

PARTS AVAILABLE FROM LNW RESERARCH
4116 - 200ns RAM

6 chip set	$26.00
8 chip set	$33.50
16 chip set	$64.00
24 chip set	$94.00
32 chip set	$124.00

LNW80 "Start up parts set"	LNW80-1	$82.00
LNW80 "Video parts set"	LNW80-2	$31.00
LNW80 Transformer	LNW80-3	$18.00
LNW80 Keyboard cable	LNW80-4	$16.00
40 Pin computer to expansion cable		$15.00
System Expansion Transformer		$19.00
Floppy Controller (FD1771) and UART (TR1602)		$30.00

LNW RESEARCH
CORPORATION

2620 WALNUT
TUSTIN CA. 92680

CIRCLE 278 ON READER SERVICE CARD

ORDERS & INFO. NO. 714-544-5744
SERVICE NO. 714-641-8850

VISA MASTER CHARGE ACCEPTED

UNLESS NOTED ADD $3 FOR SHIPPING

magazines. Armed with the component checklists provided in the LNW assembly manual, I perused the catalogs and magazine advertisements looking for the best buys on the various components I needed to construct the System Expansion.

I found that resistors were a bargain from one supplier, while integrated circuits were better purchased from another. Another vendor had great IC prices, but his capacitor prices were outrageous. The results were separate orders to six vendors in four states. With my orders for parts in the mail, I sat back and impatiently waited for the components to arrive.

A stroke of luck—the first order to arrive consisted of some integrated circuits and all of the IC sockets I needed for the interface. Actual construction began with mounting and soldering all of the sockets on the PC board. Next, the resistors and capacitors were added. Finally, all the diodes were inserted and soldered in place. I worked on the interface a few evenings a week over a period of two months.

It was just three days shy of the second month when my final parts order arrived. If all the components had been readily available, eight or nine evenings would have been all the time needed to complete the board and thoroughly check my handiwork.

Testing

The main power to the System Expansion is provided by a TRS-80 computer transformer. The LNW onboard power supply takes the raw transformer voltages and provides the regulated +5V, -5V, +12V, and -12V needed to activate the rest of the board. These voltages are isolated from the main part of the System Expansion by five jumpers, and the LNW assembly manual has a procedure for testing them out before the jumpers are added and power is supplied to the rest of the board.

When I first powered up the System Expansion, I expected something to happen, such as blowing both onboard fuses or at least a little puff of smoke. Nothing! I proceeded with LNW's test procedure taking voltage readings at designated test points with a DMM. Everything in the power supply section checked out fine.

Next, I added the jumpers providing power to the rest of the board. Please note, all of the IC sockets were empty at this time. I saw no reason to test a fully loaded board and take the chance of incinerating some expensive integrated circuits.

I proceeded with LNW's next test procedure. All voltage supplies checked out except for one of the +5 volt sections. I traced the +5 volt supply through the schematic and onto the board, and found a couple of terminating resistors bridged together with solder and loading down the +5 volts to less than 3.2 volts. A light touch with the tip of a soldering iron rectified the problem and all voltages checked out.

Verifying the power supply voltages is the extent of the testing procedures provided in LNW's manual. Still being cautious, I decided to test the rest of the System Expansion one section at a time. The first section I tested was the Dual Cassette Control.

Using the parts list by section, I inserted the required IC chips into their proper sockets, and attached two cassette recorders to the DIN connectors. I powered up the System Expansion and the keyboard, and loaded blank tape into each recorder. I wrote a short Basic program and entered CSAVE#-1'TEST'. The first recorder responded. I then entered CSAVE#-2'TEST' and the second recorder fired up. To complete the test of the Dual Cassette Control, I CLOADed the test program from each recorder and ran the program. Both recorders saved and loaded data perfectly. So far, so good.

The next section I tested was the 32K memory. I tested this section in 16K increments. Why annihilate 16 RAM chips at once when I could do it in two easy steps. The first eight chips were inserted and power was applied to the system. I entered ?MEM from the keyboard and lo and behold a number greater than 15,572 magically appeared on the screen. I ran a RAM test routine and all the memory checked out. I was feeling pretty good at this point and inserted the other eight RAM chips.

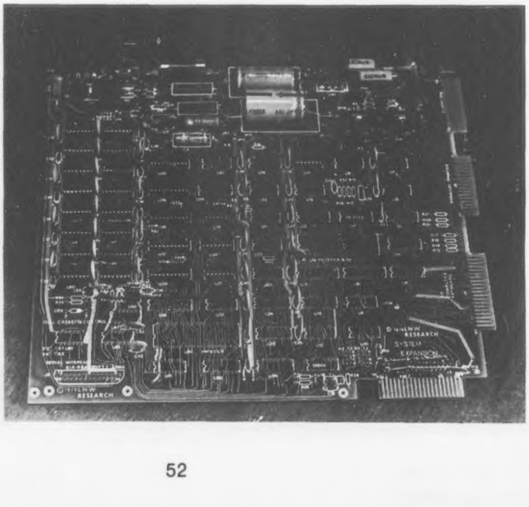
PRINT MEM yielded 48,340 this time. The RAM test confirmed that all, including the new 32K memory addition, was functioning properly. Now my ego was really soaring. It must have been up to eleven points on a ten point scale. Confidence in my construction ability was at an all time high, so I decided to forge ahead, even though it was 1:30 in the morning.

Next on the list for testing was the parallel printer port. The relevant chips were inserted and a printer cable connected between the System Expansion and a borrowed printer. I powered up the entire system and CLOADed the test program mentioned earlier. I entered LLIST and *Eureka* the program listing was output to the printer. I modified the program by changing all the PRINT statements to LPRINT. RUN ENTER produced a nicely formatted report on the printer. Three sections tested and I was batting a thousand. I decided to check one more and call it a night.

I inserted the integrated circuits required for the Floppy Disk Controller section. The 40-pin FD-1771 disk controller chip took some effort to get into its socket. There always seemed to be one or two pins that slipped out of alignment. Finally, the FD-1771 was properly inserted, and I connected a borrowed disk drive to the interface and applied power to the system—again.

I inserted a diskette into the drive and pushed the reset button. Nothing happened! What was wrong? I checked the power switches. Everything was on. I checked the floppy cable and that looked fine.

I read the DOS manual (When all else fails, read the instructions. Right!!) and discovered that DRIVE 0 must be the terminal drive, i.e., the last drive on the cable, and it must be the drive farthest away from the interface. Also, the connector nearest the interface must always be attached to a drive. My borrowed disk drive and cable came from a friend with a two drive system and he only lent me one drive. I moved the drive to the first connector on the cable, and this time when I pushed the reset button the drive activated, the CRT screen went blank for a second, and *voila*! DOS READY appeared on the screen. I ran the TEST2 utility provided on the TRSDOS diskette



The LNW Research System Expansion with power supply and 32K. Transformer not shown.

to stress test the floppy controller. The test was successful and I decided to pack it in for the night. I'd test the RS-232C/20mA interface in the morning.

The last of the ICs was put on the board. The 40-pin UART went into its socket without a hitch. It's amazing what a little experience or a couple hours of sleep and four cups of coffee will do for one's manual dexterity. I entered a serial interface routine LNW provided in the appendix of their manual. The RS-232C/20mA interface worked like a charm. Testing of the System Expansion was complete. All sections worked and I had an expansion interface equal to Radio Shack's with the added plus of an RS-232C/20mA serial interface.

The Bottom Line

Did I really save money by going the construction route to upgrade my Model I? My answer has to be a definite yes. Was the completed unit worth the time, effort and, on occasion, aggravation required to construct it? Again, I must answer in the affirmative. Permit me to elaborate.

My total cost for the printed circuit board, sockets, resistors, capacitors, power pack, miscellaneous hardware, integrated circuits, including sixteen 4116 memory chips, was $310. I built a case for the completed board and two power packs—one for the System Expansion and one for the CPU—from some scrap lumber I had in my workshop. If you don't have access to any scrap lumber, another $10 or so can be added to the overall cost.

A substantial investment indeed; but still quite a bit under Radio Shack's price.

Check the discount mail order advertisements in this magazine for the cost of a Radio Shack Expansion Interface. The cheapest one I found was $249. Check out the prices on 4116 memory chips. The best value I found was $40 for eight chips. That totals to $349—only $29 more then I invested and no construction required. But hold on for just one second, the System Expansion includes an RS-232C/20mA I/O section and my total cost includes the components required for this serial interface.

Check the advertisements again, and you'll find that $89 is about the best buy you can find for Radio Shack's RS-232C option. Now your cost is up to $418. A $100 savings should be worth the time and effort required for anyone to build the unit. It was for me.

An added advantage of constructing the LNW System Expansion is the ability to repair any problems that may develop with the unit. Armed with the schematic diagram, the sectionalized parts list and the circuit descriptions provided by LNW, a minimum of time and effort should be all that is needed to locate and fix most troubles. Please note that this last statement assumes some electronic and trouble-shooting ability.

Conclusion

I've been using my System Expansion for the past four months. I have my own printer and disk drive attached to the unit. You can borrow hardware from friends for only so long before they start forcing lease with option to buy contracts on you. Well, the System Expansion has been performing very well. I haven't experienced any crashes or erratic operation. Disk I/O has been impeccable. Everything has been functioning perfectly.

So, if you possess the skills I mentioned earlier, want to save some of your hard-earned money and want the satisfaction of building a sophisticated piece of computer equipment, then I recommend the LNW System Expansion. You won't be disappointed. ☐

Apple II

Power Tools for Programmers

creative computing software

Shape Master

This powerful utility allows you to rapidly create, combine, display, edit, save, and print out high resolution shapes for use in your Apple programs. Two separate, convenient entry methods on five user-selected grid sizes ranging from 13 by 23 to 39 by 69 allow for easy definition of many different shapes. A built in character set in three different sizes makes it easy to mix text and graphics in your displays. The "smart" printout routines allow you to make a hard copy of your shapes, even with a non-graphics printer. A reverse command allows a quick mirror image of any one of your shapes. The edit commands allow you to edit shapes and shape tables, thus you can create, load, merge and delete individual shapes from your shape table. The illustrated, comprehensive manual includes tips on using shapes in your programs. Four games and two graphics demos are included on the diskette to illustrate what you can do with this program. This package was reviewed in *Creative Computing*, June 1981, page 44.

Requires 48K Apple II Plus or Applesoft in ROM. Diskette CS-4805 $24.95

Disk Doctor

Read and modify Apple diskettes with this easy-to-use diskette track-and-sector editor, whether they were created by DOS 3.2, DOS 3.3, the Pascal system or Apple CP/M. Simple editing commands allow you to display any sector and freely edit it on screen, entering changes either as hex or character data. Special commands allow you to print a hard copy of the sector in either 40- or 80-column format. Disk Doctor will also test your diskettes, verifying every sector, whether vacant or filled with data. You can also format and verify a disk in one operation.

This powerful tool should be in your library. Whether you need to verify the reliability of your diskettes, patch DOS, edit a data file in place, or repair a damaged sector, you can't afford to be without Disk Doctor.

32K or larger Apple II or Apple II Plus, diskette CS-4806 $19.95

Order Today

To order these software packages, send payment plus $2.00 postage and handling (per order) to the address given. Visa, MasterCard, and American Express orders may be called in toll free. Order today at no risk. If you are not completely satisfied, your money will be promptly and courteously refunded.

Creative Computing Software
Morris Plains, New Jersey 07950
Toll-free **800-631-8112**
In N.J. 201-540-0445

CIRCLE 300 ON READER SERVICE CARD

BRING IN THE NEW YEAR!

LOOK CLOSELY AT THESE SUPER SAVINGS!!

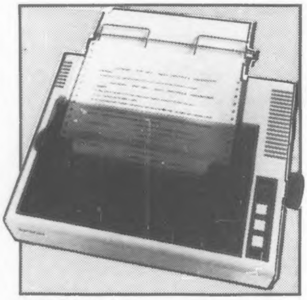
SAVINGS!

AMAZING SPECIALS!

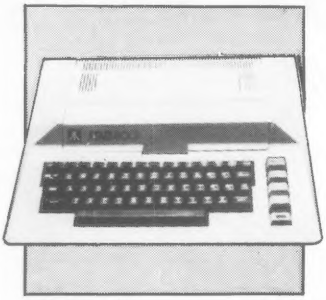
Ω OMEGA SALES CO.

• We Accept C.O.D.'s • Stock Shipments Same Day or Next • No Surcharge For Credit Cards • All Equipment Factory Fresh w/MFT Warranty • We Carry the Complete Line of Personal Software

NEC Color Monitor
JC 1201 $319



EPSON MX-80 $ 469



ATARI 800 16K $ 749

INTERTEC SUPERBRAIN 64K RAM	**$2799**
QD SUPERBRAIN	$2999
NEC 5510 SPINWRITER (7710)	**$2345**
NEC 5520 SPINWRITER (7720)	$2695
NEC 5530 SPINWRITER (7730)	$2345
NEC 12" MONITOR	$ 189
NEC COLOR 12" MONITOR	$ 339
NEC PC 8023 Printer 100 CPS Tractor & Friction	$ 639
OKIDATA MICROLINE-80	**$ 379**
OKIDATA MICROLINE-82A	$ 529
OKIDATA MICROLINE-83A	$ 749
DIABLO 630	$1995
APPLE II PLUS 48K	**$1139**
APPLE DISK w/3.3 DOS Controller	$ 525
APPLE DISK w/o Controller	$ 449
EPSON MX-80	$ 469
Interfaces: IEEE $55, TRS-80 CABLE $35, APPLE INTERFACE & CABLE $90, RS-232 $70	
HAZELTINE 1420	$ 799
NORTHSTAR HORIZON II 32K QD	$2925
ANADEX DP-9500/9501	$1199
TELEVIDEO 912C	**$ 699**
TELEVIDEO 920C	$ 729
TELEVIDEO 950	$ 929

WE CARRY THE COMPLETE LINE OF ATARI SOFTWARE, PERIPHERALS AND ACCESSORIES.

EAST COAST
1-800-556-7586

Ω

WEST COAST
1-800-235-3581

PRICES ARE SUBJECT TO CHANGE W/O NOTICE.

OMEGA SALES CO.

NEC Green 12 Inch Monitor
JB 1201 $179

NEC Friction Tractor Printer
100 CPS (Graphics, Bi-directional) $635

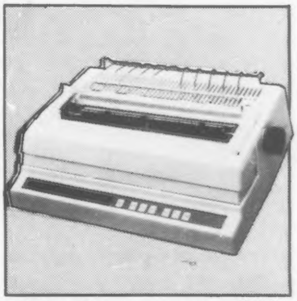
CBM 8032 COMPUTER	$1149
CBM 8050 DISK DRIVE	$1349
CBM 4032 COMPUTER	$1029
CBM 4040 DISK DRIVE	$1029
CBM 4022	$ 649
CBM VIC-20	$ 269
LEEDEX/AMDEK 100	**$ 139**
LEEDEX/AMDEK 100G	$ 169
LEEDEX/AMDEK COLOR-1 13" Color Monitor	$ 329
MICROTEK 16K RAM BOARD for Atari	$ 79
MICROTEK 32K	$ 149
ATARI 800 16K	**$ 749**
ATARI 400 16K	$ 349
ATARI 810 DISK DRIVE	$ 449
ATARI 820 40 Column Printer	$ 299
ATARI 822 40 Column Thermal Printer	$ 349
ATARI 825 80 Column Printer	$ 599

OMEGA SALES CO.

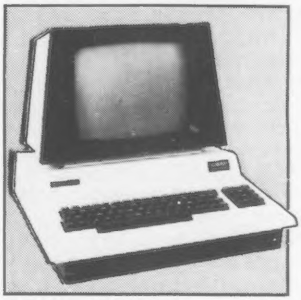
EAST COAST
1-800-556-7586
OMEGA SALES CO.
12 Meeting St.
Cumberland, RI 02864
1-401-722-1027

WEST COAST
1-800-235-3581
OMEGA SALES CO.
3533 Old Conejo Rd. #102
Newbury Park, CA 91320
1-805-499-3678
CA. TOLL FREE 1-800-322-1873

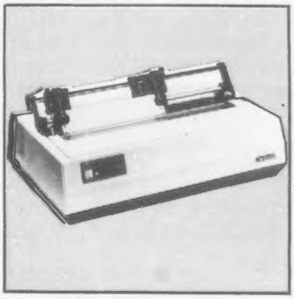
CIRCLE 213 ON READER SERVICE CARD



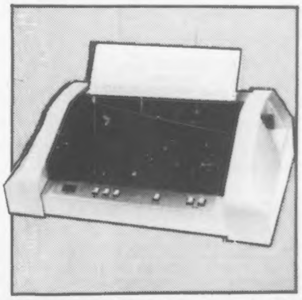
DIABLO 630 $1995



CBM 8032 COMPUTER $1149



OKIDATA MICROLINE-83A $ 749



ANADEX DP-9500/9501 $1199

creative
computing
equipment
evaluation

Aurora Systems Videodisc Controller

David H. Ahl

For years, we have been enthusiastic about coupling a computer to a videodisc. Initial proponents predicted that the main function of the videodisc would be to carry programs and data in very large quantities, and serve principally as a local data base. After all, a disc can hold 10^{11} bits of information which is a very great amount indeed.

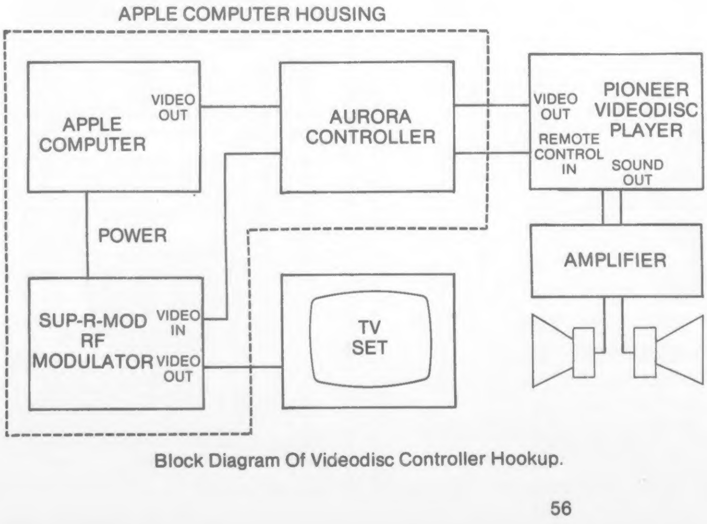
However, videodisc players first came into their own as industrial and educational learning devices and several commercial players for industrial use were introduced in 1978 and 1979. For use as a home entertainment device, further engineering and cost reductions were necessary, and players did not become commercially available until late in 1980. Unfortunately, the first player (Magnavox) did not have provision for external remote control. Thus, to build a computer-to-videodisc interface would have involved disassembling the player and messing about with wires, integrated circuits, and the like. Furthermore, this sort of messing around would have voided the guarantee of the player and consequently no one was anxious to introduce an interface for which there would be a small, if not non-existent, market.

However, the Pioneer VP-1000 Videodisc Player, introduced in early 1981, is much more hospitable to an external interface. This is because it has a remote control unit which can either work by an infrared light signal from across the room or hardwired with a long cable to a jack in the back of the player.

Unlike many video cassette recorders in which the remote control unit provides only a few functions, the Pioneer RU-1000 remote control unit duplicates all of the videodisc player functions. Thus, it is a relatively straightforward job to produce a computer-to-videodisc interface which will duplicate the functions of the Pioneer remote control unit.

In addition to sending a control signal to the player, a good interface must also accept the video signal from the player and marry it to the video signal from the computer. The designers of the Aurora Systems videodisc controller chose the easy way to solve this problem. In particular, the interface merely switches back and forth between the two video signals. In other words, the output from the computer or the output from the videodisc player may be displayed on the screen but not both at once. Some other interfaces permit mixing the computer and video signal, however, their price puts them out of the range of most home or educational systems. (Can you justify paying more for the interface than for the videodisc player itself?)

Insofar as providing the control signals to the videodisc player, the Aurora controller does a very good job.



Block Diagram Of Videodisc Controller Hookup.

The Hardware

The hardware consists of one printed circuit board which is normally plugged into slot number 4 in the Apple. Both the video signals from the Apple and the videodisc player must be plugged into this board. A short cable is provided to plug into the output of the Apple video signal and plug into the board. Another cable is provided to connect the video out of the Pioneer VP-1000 player and the board. (This cable was missing from our interface kit.) The last video cable is an output from the video board; it provides a composite video signal which can be connected to a monitor.

To use the controller with an ordinary television set (as opposed to a video monitor) it is necessary to connect the video output from the controller to the input of an RF modulator such as the Sup'R'Mod modulator. The manual admonishes one to "be sure to disconnect any other video inputs to the modulator (such as may be connected to pin #2 of the auxiliary video connector on the Apple II board). This may involve clipping of the video input wire or removing the #2 contact of the Molex KK100 connector. If your modulator derives its power from the Apple you must leave the other three wires undisturbed."

I wasn't anxious to clip the wire because it might be one that I wanted to use again. However I found that a very small screwdriver would easily unfasten the contact from the Molex connector. The question then became: which is the number 2 contact? Trial and error revealed it was the second contact from the right of the connector as one faces the front of the Apple.

One other cable had to be connected between the board and the remote control input on the videodisc player. The cable with the Pioneer remote control unit handled this job nicely.

The Software

The interface comes with a DOS 3.3 disk of software. This disk includes all the necessary routines, both in Basic and machine language, to incorporate into user programs to allow control of the videodisc player. The routines are located in page three of the Apple memory, so they do not interfere with normal programs.

The manual gives a rather sketchy discussion of how to use the software in user programs. However, we found that by listing the demonstration program on the disk it was quite easy to see how things were done and we had no trouble incorporating the routines into our own programs. Since these demonstration programs are rather lengthy and only a small portion fits on the screen at one time, we found it very helpful to list the programs on a line printer and refer to the listings when writing our own programs.

Instrument Interfaces
Videodisc Controller Code Table

Character	Function	Hex	Decimal
V	Screen Set	$56	86
X	Screen Flip	$58	88
Z	Pause	$5A	90
P	Play	$50	80
N	Fast Reverse	$4E	78
M	Fast Forward	$4D	77
H	Scan Reverse	$48	72
J	Scan Forward	$4A	74
Y	Slow Reverse	$59	89
U	Slow Forward	$55	85
T	Step Reverse	$54	84
I	Step Forward	$49	73
L	Left Audio	$4C	76
R	Right Audio	$52	82
S	Search	$53	83
Q	Reject	$51	81
C	Chapter	$43	67
F	Frame	$46	70
0		$30	48
:	Numbers	:	:
9		$39	57

The videodisc control codes table in the manual had one nasty typo which caused us several minutes of consternation. One of the most frequently used commands is "step forward" because it is the one that freezes a video frame on the screen. Unfortunately, the manual lists the incorrect hex and decimal code for this function. Indeed, the code listed sends the numeral 2 to the player. The correct code is shown in the code table with this review.

Nothing is Perfect

As with every new technology, there are bound to be some bugs and glitches, particularly in early production models. Such was the case with our Pioneer VP-1000 player. We found that the "step reverse" function worked on some disks and not on others. And even when it was working, it was frequently intermittent and unreliable. Since, of course, "slow reverse" depends upon "step reverse" working, it did not work either. It did, however, work at "full speed," that is, with the slow motion control set on 100% (which is not slow motion at all) the slow reverse function would work.

We also found that "scan reverse" would only work if held down for a second or two. This is normal and does not seem to be a player malfunction. Unfortunately, the videodisc interface has no good way of sending some commands for just a burst and others for a second or more. It is possible, but inconvenient, to get around this in the user software.

Price of the interface is about $250. It is available from Aurora Systems Inc., 2040 East Washington Avenue, Madison, WI 53704. □

OMNISCAN T.M.

The interface that provides the most revolutionary means of information retrieval since the printing press by combining these important technologies:

1) *the Apple II computer,*
2) *the Pioneer VP-1000 Laser Video Disc,*
3) *and the Color Television.*

The **OMNISCAN** *interface is used to control the Pioneer LaserDisc player in an interactive way, with software running on the Apple II computer. The system can display information with color, motion, and stereo or bilingual sound* ***under program control.*** *It can teach, review, test, and grade material while allowing for individual learning rates. The branching capability of the computer gives unlimited flexibility in programing a learning sequence.*

Documentation on the hardware and a tutorial on the software is provided.

Price: $ 250 *Dealer inquiries invited*

aurora systems, inc.
2040 E. Washington Ave.
Madison, WI 53704
608 - 249 - 5875

OMNISCAN is a trademark of Aurora Systems, Inc.
Apple II is a trademark of Apple Computers, Inc. VP-1000 is a trademark of Pioneer USA, Inc.

CIRCLE 107 ON READER SERVICE CARD

APPLE* OWNERS

R.H. ELECTRONICS
COMPUTER PRODUCTS
ROY HICKS, Owner
566 Irelan, Bin CC
Buellton, CA 93427
(805) 688-2047

ALSO AVAILABLE:
Super Ram II Card - $160.00*
The Best Ram Card on the Market
*Plus 6% California Sales Tax and $2.50 shipping charge per item.

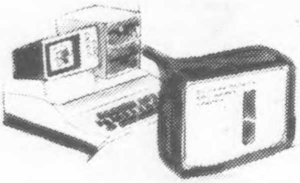
SUPER FAN II
FOR YOUR APPLE II COMPUTER*
$69⁰⁰ *

"COOL IT"
- TAN COLOR
- DURABLE MOTOR
- REPLACEABLE SWITCH
- CLIPS ON—NO HOLES OR SCREWS
- AVAILABLE IN 120V OR 240V AND 50/60HZ
- REDUCES HEAT CAUSED BY EXTRA PLUG-IN CARDS
- INCREASED RELIABILITY—SAVES DOWN TIME AND REPAIR CHARGES
- LOW NOISE DUE TO DRAWING EFFECT OF AIR THROUGH YOUR COMPUTER AND SPECIAL FAN AND MOTOR DESIGN—"QUIETEST FAN ON THE MARKET"
- EXTRA 120V OUTLET FOR MONITOR OR ACCESSORIES (NOT AVAILABLE ON 240V MODEL)
- SOLD WORLD-WIDE • UNIQUE 1 YEAR WARRANTY

HOW TO HOOK IT UP: 1) Clip it on your APPLE. 2) Unplug your 120V cable (you won't need it). 3) Plug short 120V cable from Super Fan II to the back of your computer. 4) Plug the supply cable from Super Fan II to your 120V power source. 5) Turn on the rocker switch and a built-in red, ready light comes on. 6) You are all set to **"COOL IT."** This switch also turns your computer "off" and "on."

CIRCLE 326 ON READER SERVICE CARD

Adwar ARS 170A puts Apple™ color graphics on the air.



Standby for broadcastable color graphics generated by your Apple computer.

With the Adwar ARS 170A your Apple computer can now be used to generate high resolution color graphics suitable for broadcasting within NTSC standards.

What a great idea!

And the nicest part about it is the price. You get state-of-the-art capabilities at a fraction of the cost of larger computer/video graphics systems.

So if you want to put your crisp color graphics on the air and keep your costs on the ground, look into the Adwar ARS 170A.

For detailed information on the ARS 170A and the many other video innovations from Adwar, mail in the coupon below or call today at (212)691 0976

Adwar Video Corp.
100 Fifth Ave
NYC NY 10011

ADWAR VIDEO CORP

Name

Address

City/State/Zip

Please send more information on
☐ Adwar ARS 170A
☐ Other Adwar video products

CIRCLE 103 ON READER SERVICE CARD

The Video Buyers Edge.

CIRCLE 103 ON READER SERVICE CARD

creative computing equipment evaluation

Adwar Video Proc Mod

David H. Ahl

Have you ever tried to make a video tape from your Apple? If so, you may have noticed a loss of color, particularly if you have an older Apple computer. The reason for this is that the standard video signal from the Apple does not conform to standard video tolerances. This is especially noticeable on certain home video cassette recorders which are somewhat unforgiving when presented with a non-standard signal. Newer Apple computers are less prone to have this problem, as the video circuitry has been "cleaned up" somewhat.

The Adwar Proc Mod is a circuit board which plugs into slot number 7 of the Apple and processes the sync information portion of the video signal. It brings the Apple signal closer to standard video tolerances so that video tape recorders and other equipment receive the expected synchronization level, phase, and width.

The Proc Mod is simple to install. The board plugs into slot 7 and a wire with a hook connector on it is connected to the second pin from the right on the Molex video connection in the back of the Apple. This connection does not disturb the RF modulator which is normally plugged into this connector.

The Proc Mod circuit board has a male BNC connector which becomes the new video output connector. Unfortunately, today most video equipment uses either F or RCA phono connectors and the BNC connector is not something one would be likely to have kicking around. My Zenith videotape recorder, for example, has an RCA phono plug for the video input. I looked far and wide and could find no cable supplier that stocked RCA male to BNC female cables. However, a $1.59 connector and some solder solved the problem and I was on my way to making some of the cleanest, sharpest videotapes of my computer that I had ever seen.

Incidentally, it is possible to use the Proc Mod in conjunction with the Aurora Systems Videodisc interface (discussed elsewhere). I used the word "possible" loosely because by the time everything was hooked up, the inside of my Apple was an incredible jungle of cables and looked like a nest of worms. Nevertheless, it did work, and we have been showing the resulting tapes at several conventions and trade shows this fall.

The Scanning Rate Problem

The Apple computer uses a non-standard scanning rate of 524 lines per frame. This will prevent many time base correctors on professional video equipment from accepting the Apple signal. The Adwar Apple Proc Mod will not correct this because more sophisticated signal processing is required. Adwar Video makes such a product, the ARS-170A signal processor. It stores in solid state memory an entire Apple frame and reads it out at the proper scanning rate (525 lines per frame) for NTSC video equipment. It actually remembers two complete frames, storing one while reading out the previous frame, performing all this in real time (with one frame delay).

This signal processor would generally not be needed for most home or commercial equipment. Only if one contemplates serious professional studio work would such a processor be required (or cost justified!).

Price of the Adwar Apple Proc Mod is $300. Price of the ARS-170A is $1850. Both products are available from Adwar Video, 100 Fifth Ave., New York, NY 10001. ☐

COMPUTER CENTER

31 East 31st Street • New York, N.Y.
(between Madison & Park Avenues)

480 Lexington Avenue • New York, N.Y.
(American Brands Bldg., between 46th & 47th St.)

presenting the LARGEST SELECTION OF SOFTWARE EVER ASSEMBLED...

for ATARI® • APPLE® • PET® • TRS-80® and other Microcomputers

at SUPER DISCOUNT PRICES!

ATARI

☐ MISSILE COMMAND (AT)	35.95
☐ ASTEROIDS (AT)	35.95
☐ SPACE INVADERS (AT)	35.95
☐ ASSEMBLER DEBUG (AT)	53.95
☐ BASKETBALL (AT)	35.95
☐ VIDEO EASEL-LIFE (AT)	35.95
☐ SUPER BREAKOUT (AT)	35.95
☐ MUSIC COMPOSER (AT)	53.95
☐ COMPUTER CHESS (AT)	28.00
☐ 3-D TIC TAC TOE (AT)	35.95
☐ STAR RAIDERS (AT)	44.95
☐ PADDLES (AT)	17.95
☐ JOYSTICKS (AT)	17.95

ADVENTURE INTERNATIONAL

☐ ADVENTURE #0 (AP,T)	6.25
☐ ADVENTURE (1,2,3) [D] (AP,T)	35.95
☐ ADVENTURE (4,5,6) [D] (AP,T)	35.95
☐ ADVENTURE (7,8,9) [D] (AP,T)	35.95
☐ ADVENTURE (10,11,12) [D] (AP,T)	35.95
☐ ADVENTURE (specify 1-12) (AP,T,AT)	17.95
☐ PROJECT OMEGA (T) [D]	22.50
☐ PLANETOIDS [D] (AP)	17.95
☐ MEAN CHECKERS MACHINE (T)	17.95
☐ DR. CHIPS (T)	17.95
☐ KID-VENTURE 1 (AP,T)	17.95
☐ LUNAR LANDER (T,AT)	17.95
☐ MOUNTAIN SHOOT (AT)	8.95
☐ SLAG (T)	17.95
☐ STAR TREK 3.5 (AT,T)	17.95
☐ STAR TREK 3.5 [D] (T)	17.95
☐ SUNDAY GOLF (AT)	13.55
☐ ZOSSED IN SPACE (T)	17.95
☐ SILVER FLASH (T)	17.95
☐ SILVER FLASH [D] (T)	17.95
☐ MISSILE ATTACK (T)	17.95
☐ STAR SCOUT (T)	17.95
☐ GALACTIC EMPIRE (AT,T)	17.95

AVALON HILL

☐ MIDWAY (AT,AP,P,T)	13.50
☐ NUKE WAR (AT,AP,P,T)	13.50
☐ PLANET MINERS (AT,AP,P,T)	13.50
☐ CONVOY RAIDER (AT,AP,P,T)	13.50
☐ B1 BOMBER (AT,AP,P,T)	13.50
☐ LORDS OF KARMA (AT,AP,P,T)	18.00
☐ CONFLICT 2500 (AT,AP,P,T)	13.50
☐ TANKTICS (AT,AP,P,T)	21.50

ACORN SOFTWARE

☐ ATERM (T)	17.95
☐ SYSTEM SAVERS (T)	13.55
☐ DISASSEMBLER (T)	13.55
☐ DISK/TAPE UTILITY (T)	17.95
☐ STAR TREK SIMULATION (T)	8.95
☐ GAMMON CHALLENGER (T)	13.55
☐ PIGSKIN (T)	13.55
☐ ULTRA TREK (T)	13.55
☐ SPACE WAR (T)	8.95
☐ WARP/LANDER (T)	8.95
☐ BASKETBALL [D] (T)	18.95
☐ BASKETBALL (T)	13.55
☐ DUEL-N-DROIDS [D] (T)	18.95
☐ DUEL-N-DROIDS (T)	13.55
☐ INVADERS FROM SPACE (T)	13.55
☐ INVADERS FROM SPACE [D] (T)	18.95
☐ PIGSKIN [D] (T)	18.95
☐ PINBALL (T)	13.55
☐ PINBALL [D] (T)	18.95
☐ SUPERSCRIPT [D] (T)	28.95
☐ EVEREST EXPLORER (T)	13.55
☐ EVEREST EXPLORER [D] (T)	18.95

EPYX-AUTOMATED SIMULATIONS

☐ TUESDAY QUARTERBACK [D] (AP,T)	26.95
☐ STAR WARRIOR [C,D] (AP,AT,T)	35.95
☐ THREE PACK [D] (AP,P,T)	45.00
☐ STARFLEET ORION [C,D] (AP,T)	22.50

If you don't see it listed, write... we probably have it in stock!

EPYX-AUTOMATED SIMULATIONS

☐ STARFLEET ORION [C] (P,T)	22.50
☐ INVASION ORION [C,D] (AP,AT,T)	22.50
☐ INVASION ORION [C] (P,AT)	22.50
☐ TEMPLE OF APSHAI [D] (AP,T)	35.95
☐ TEMPLE OF APSHAI [C] (P,T)	35.95
☐ DATESTONES OF RYN [D,C] (AP,AT,T)	17.95
☐ DATESTONES OF RYN [C] (P,AT)	17.95
☐ MORLOC TOWER [C,D] (AP,T)	17.95
☐ MORLOC TOWER [C] (P,AP)	17.95
☐ RESCUE AT RIGEL [C,D] (AP,AT,T)	26.95
☐ RESCUE AT RIGEL [C] (P,AT)	26.95
☐ HELLFIRE WARRIOR [D] (AP,T)	35.95
☐ HELLFIRE WARRIOR [C] (P)	35.95

BIG FIVE SOFTWARE

☐ ATTACK FORCE (T)	14.30
☐ GALAXY INVASION (T)	14.30
☐ METEOR MISSION II (T)	14.30
☐ SUPER NOVA (T)	14.30
☐ COSMIC FIGHTER (T)	14.30
☐ ROBOT ATTACK (T)	14.30

MED SYSTEMS

☐ DEATH MAZE 5000 (AP) [D]	15.30
☐ DEATH MAZE 5000 (T)	11.65
☐ LABYRINTH (T)	11.65
☐ RATS REVENGE (T)	11.65
☐ REALITY ENDS (T)	11.65

CALIF. PACIFIC

☐ ULTIMA (AP) [D]	35.95
☐ AKALAPETH OIDS (AP) [D]	31.50
☐ APPLE (AP) [D]	26.95
☐ FENDER BENDER (AP) [D]	22.50
☐ RASTER BLASTER (AP) [D]	24.00
☐ BUDGE'S SPACE ALBUM (AP) [D]	35.95
☐ BUDGE'S TRILOGY (AP) [D]	26.95

MICRO LAB

☐ CROWN OF ARITHIAN (AP) [D]	31.50
☐ DATA FACTORY (AP) [D]	130.00
☐ MINI FACT (AP) [D]	65.95
☐ DOG FIGHT (AP) [D]	26.95
☐ MAD VENTURE (AP) [D]	22.50

SIRIUS SOFTWARE

☐ OUTPOST (AP) [D]	26.95
☐ EPOCH (AP) [D]	31.50
☐ SNEAKERS (AP) [D]	26.95
☐ GORGON (AP) [D]	33.00
☐ CYBER STRIKE (AP) [D]	36.00
☐ PHANTOM FIVE (AP) [D]	26.95
☐ SPACE EGGS (AP) [D]	24.00
☐ ORBITRON (AP) [D]	26.95

SIR-TECH

☐ WIZARDRY (AP) [D]	44.95
☐ GALACTIC ATTACK (AP) [D]	26.95

CAVALIER SOFTWARE

☐ ASTEROID FIELD (AP) [D]	22.50
☐ STAR THIEF (AP) [D]	26.95
☐ BUG ATTACK (AP) [D]	26.95

STRATEGIC SIMULATIONS

☐ SHATTERED ALLIANCE [D] (AP)	51.50
☐ COMPUTER BISMARCK [D] (AP,T)	51.50
☐ MAJOR LEAGUE BASEBALL [D] (AP)	31.50
☐ COMPUTER CONFLICT [D] (AP)	35.00
☐ COMPUTER NAPOLEONICS [D] (AP)	51.50
☐ COMPUTER QUARTERBACK [D] (AP)	35.00
☐ COMPUTER AIR COMBAT [D] (AP)	51.50
☐ WARP FACTOR [D] (AP)	35.00
☐ CARTELS & CUTHROATS [D] (AP)	51.50
☐ OPERATION APOCALYPSE [D] (AP)	51.50
☐ TORPEDO FIRE [D] (AP)	51.50

SUB-LOGIC

☐ 3D GRAPHICS (AP)	45.00
☐ 3D GRAPHICS [D] (AP)	53.00
☐ A-2 FS1 FLIGHT SIMULATOR (AP)	22.00
☐ A-2 FS1 FLIGHT [D] (AP)	29.00
☐ T80-FS1 FLIGHT SIMULATOR (T)	22.00
☐ 3D GRAPHICS (T)	26.50

PERSONAL SOFTWARE

☐ CCA MGMT. [D] (P,AT)	90.00
☐ DESK TOP PLAN II [D] (AP)	175.00
☐ VISICALC [D] (AT,P,AP)	170.00
☐ ZORK (T) [D]	35.95
☐ VISIDEX (AP) [D]	170.00
☐ VISIPLOT (AP) [D]	162.00
☐ VISITERM (AP) [D]	135.00
☐ VISITREND (AP) [D]	210.00
☐ VISIFILE (AP) [D]	220.00

MICROSOFT SOFTWARE

☐ ADVENTURE [D] (AP,T)	25.50
☐ ASSEMBLY DEVELOPMENT [D] (T)	80.00
☐ BASIC COMPILER [D] (T)	175.00
☐ EDITOR/ASSEMBLER (T)	25.50
☐ FORTRAN COMPILER [D] (T)	80.00
☐ LEVEL III BASIC (T)	44.00
☐ MuMATH [D] (T)	64.00
☐ OLYMPIC DECATHALON [D] (T,AP)	25.00
☐ OLYMPIC DECATHALON (T)	20.00
☐ TYPING TUTOR (AP,T)	13.55
☐ TYPING TUTOR [D] (AP)	17.95
☐ Z-80 SOFTCARD [D] (AP)	315.00
☐ 16k RAM BOARD (AP)	165.00

ON LINE SYSTEMS

☐ HI RES ADVEN. #0 [D] (AP)	17.95
☐ HI RES ADVEN. #1 [D] (AP)	22.50
☐ HI RES ADVEN. #2 [D] (AP,AT)	29.00
☐ HI RES ADVEN. #3 [D] (AP)	31.00
☐ HI-RES FOOTBALL [D] (AP)	36.00
☐ HI-RES SOCCER [D] (AP)	26.95
☐ HI-RES CRIBBAGE [D] (AP)	22.50
☐ MISSILE DEFENSE [D] (AP)	26.95
☐ SUPERSCRIBE II [D] (AP)	115.00

BRODERBUND SOFTWARE

☐ GALACTIC EMPIRE (AP) [D]	22.50
☐ GALACTIC TRADER (AP) [D]	22.50
☐ GALACTIC REVOLUTION (AP) [D]	22.50
☐ GALACTIC TRIOLOGY (T) [D]	35.95
☐ TAWALA'S REDOUBT (AP) [D]	26.95
☐ HYPER HEAD ON (AP) [D]	22.50
☐ GALAXY WARS (AP) [D]	22.50
☐ ALIEN RAIN (AP) [D]	20.00
☐ APPLE PANIC (AP) [D]	26.95
☐ ALIEN TYPHOON (AP) [D]	22.50
☐ SNOGGLE [D] (AP)	22.50

SYNERGISTIC SOFTWARE

☐ DUNGEON & WILDERNESS [D] (AP)	29.00
☐ DUNGEON [D] (AP)	15.75
☐ ODYSSEY [D] (AP)	25.00
☐ WILDERNESS [D] (AP)	18.00
☐ PROGRAM LINE EDITOR [D] (AP)	36.00
☐ THE LINGQUIST (AP) [D]	36.00
☐ HIGHER GRAPHICS II (AP) [D]	31.00
☐ HIGHER TEXT II (AP) [D]	31.00

SOFTWARE PUBLISHING

☐ PERSONAL FILING SYSTEM (AP) [D]	85.50
☐ PFS REPORT (AP) [D]	85.50

SENTIENT SOFTWARE

☐ 00-TOPOS (AP) [D]	29.70

TG PRODUCTS

☐ PADDLES (AP)	38.00
☐ JOYSTICKS (AP)	56.00

Check program desired.
Complete ordering information
and mail entire ad.
Immediate Shipments from stock.

Ship the above programs as checked to:

Mr./Mrs. ____________________

Address ____________________

City ____________________

State ______________ Zip ________

I have a ____________________
Name of Computer

with ______________ K memory

CREAT. COMP/JAN. 1982

Number of Programs Ordered.... ________

Amount of order.............. ________

N.Y. residents add Sales Tax....... ________

Add shipping anywhere in the U.S. 2.00

Total amount enclosed.......... ________

Charge my: ☐ Master Charge ☐ Visa

Signature ____________________

Card No. ______________ Expires ________

Personal Checks please allow 3 weeks.

KEY:
AT-Atari
AP-Apple
P-Pet
T-TRS-80
C-Cassette
D-on Disc.
If not marked-Cassette

ATARI is a trademark of ATARI INC.
APPLE is a trademark of APPLE COMPUTER, INC.
TRS-80 is a trademark of TANDY CORP
PET is a trademark of COMMODORE BUSINESS MACHINES

Prices subject to change without notice.

Mail to: **DIGIBYTE SYSTEMS CORP.**
31 East 31st Street, New York, N.Y. 10016

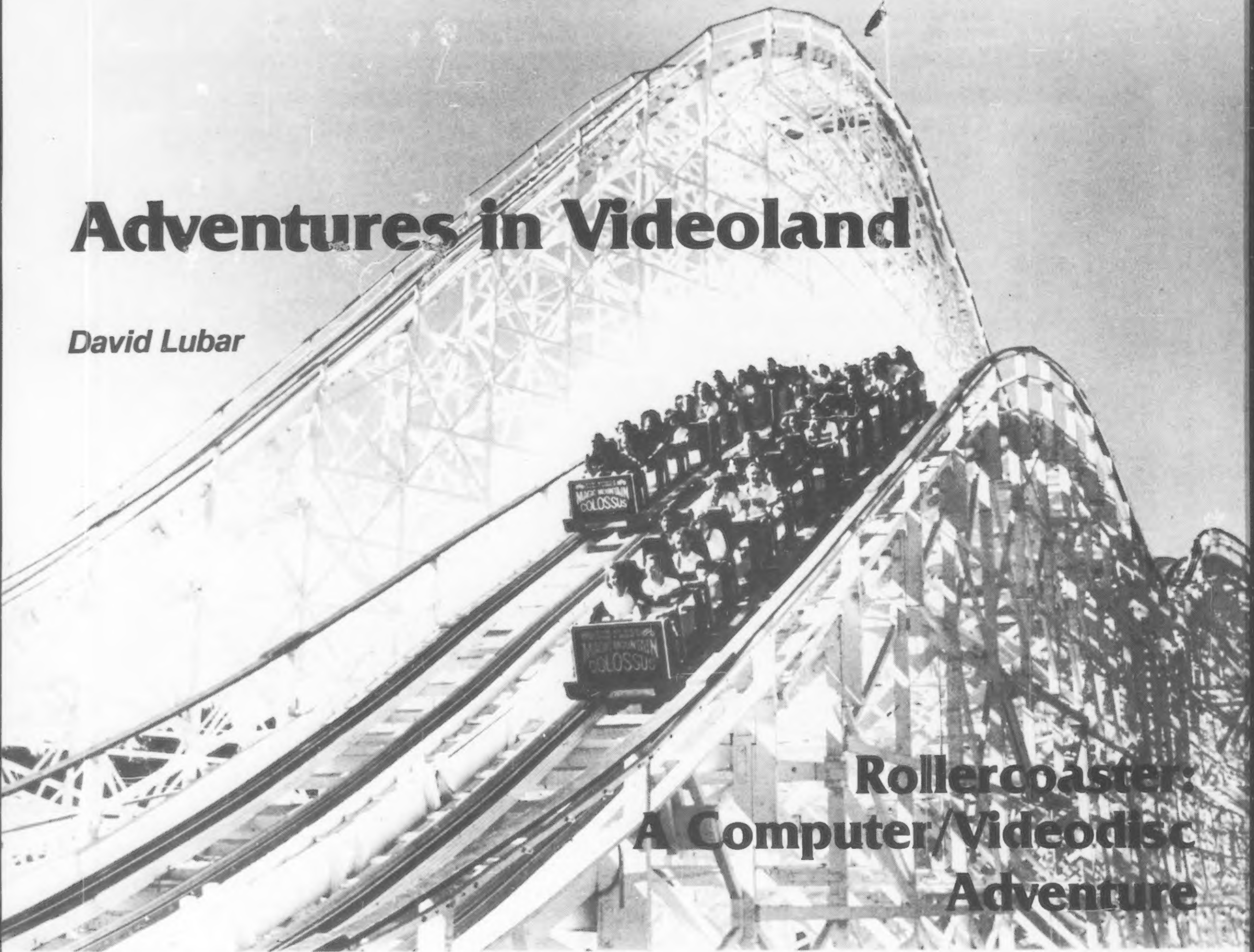
OUTSIDE NEW YORK CALL TOLL FREE (800) 221-3144
IN NEW YORK CALL (212) 889-8975

CIRCLE 173 ON READER SERVICE CARD

Adventures in Videoland

David Lubar

Rollercoaster: A Computer/Videodisc Adventure



Photos are courtesy of Six Flags Over Texas, Arlington, TX and Six Flags Magic Mountain, Valencia, CA. The roller coasters pictured are 'The Colossus' and 'The American Revolution.'

Frame One: *Editorial meetings, luck runs out, and a sweep through the Aegean stables.*

With the right misuse of eye contact, it's possible to survive a meeting intact and leave without any awesome assignments. The meeting in question was almost over when the words, "I've been saving the best assignment for last," put a choke hold on my spirit of survival. No doubt, the phrase was aimed in my direction. Realizing that the meaning of "best" varies considerably, depending on who is doing the besting, I tore my gaze from the toy robots on the bookshelf and waited to see what the boss had in mind. Since previous assignments had run the range from covering conferences to reviewing printers, there was no way to predict what might come. The suspense was short lived.

"I want you to write a videodisc adventure," the boss said in the casual manner usually associated with phrases such as "please pass the butter."

"Need it by tomorrow?" I asked.

"For January." End of topic.

Could be fun, I thought, though I had never written an adventure or toyed with the fringes of video technology. This project would require three-part harmony between an Apple computer, a Pioneer Laserdisc player, and an Aurora Systems Interface. A vague suspicion that I was in over my head prompted a stroll down to the software department. After trying all available personnel, it was obvious that no one there could be talked into whitewashing the fence. Looked like the job was mine. Since the November issue was still under construction, I put the video project on temporary hold, hoping the subconscious would start the work.

Frame Two: *Dissected disc, death of procrastination, and the birth of a framework.*

November doesn't last forever. The harbinger of flying time came in the form of a memo. While I had been blithely trying to forget the project, the boss had been busy. He had taken side one of the movie *Rollercoaster* and compiled two pages of notes listing the frame numbers for every scene. At this point, it dawned on me that he really wanted the program. I got down to work, keeping an eye open for an easy way out.

The first problem was figuring a way to write the program in Basic while avoiding the long delays associated with that language. Taking a shot at modular programming, I started by writing units that would handle essential tasks, such as gathering and parsing input, in an efficient manner. Since actual work with the disc player and interface would require a trip to the boss's house, I wanted to finish as much of the programming as possible before taking the act up to the Fortress of Solitude. This situation, coupled with the eternal search for the easy way out, gave birth to the adventure framework which

Educational Excellence

Excellent educational software is the exception rather than the rule.

Excellence in educational software. It's not easily achieved.

Many large publishers have entered the computer software business. Many have flopped. Why? Because producing good software is not the same as producing a textbook.

These disks are protected in 3.2 DOS, no copying or muffining can be done.

Tough Criteria

Good educational software must meet specific objects in the teaching/learning process. It must motivate and hold the attention of the students. It must not bore the gifted students nor be over the heads of slower students. It must be "user friendly" to both the teacher and student. And it must be accompanied by clear support material, worksheets and all the material necessary to use it effectively.

A tall order.

But one which MECC has met.

The Minnesota Educational Computer Consortium (MECC) was founded in 1973 with the goal of extending the benefits of computers to every school in the state. Over the years, MECC has developed procedures for finding and perfecting programs from contributors throughout the state.

Few Programs Qualify

Before a program is accepted for the MECC library it is judged on specific criteria. For example:

1) Accuracy ... Is all spelling and grammer correct? Does each question provide for a correct and appropriate response?

2) Audience ... Is the intended audience (grade level and subject) served by the degree of difficulty and scope of the program? Is the reading level of the text material suitable?

3) Clarity ... Are explanations and instructions sufficient, clear and straight forward? Is the presentation well-formatted?

4) Graphics ... Are the graphics appropriate and sufficient in quantity?

Other criteria include documentation, function, programming, and the like. Similar criteria are applied to the documentation. This insures that the reading level is appropriate, that objectives are well-stated and that associated materials are available.

What this all means is that the educational software packages from MECC are among the best available anywhere. They are pedigogically sound, throroughly tested and well documented.

Now the MECC software library is available to both schools and individuals through Creative Computing Software.

MECC software is currently available only on disk for the Apple II. All disks run under DOS 3.2 and require a minimum of 32K memory and Applesoft in ROM or an Apple II Plus.

Software using a printer uses the Apple serial, parallel or communications card.

Order Today

Order in confidence at no risk. All MECC software is covered by an unconditional 30-day money-back guarantee from Creative Computing Software.

To order any MECC software package, send payment plus $2.00 postage and handling to the address below. To charge an order to Visa, MasterCard or American Express include card number and expiration date. Charge orders may also be called in to our toll-free number. School purchase orders should add an additional $2.00 billing fee.

Order MECC software today for the highest quality and best value in educational software available anywhere.

Apple Demonstration Diskette
MECC-701, $19.95

A sample of the different kinds of applications available on the MECC diskettes is shown. The software demonstrates applications in drill and practice, tutorial, simulation, problem solving, and worksheet generation. Samples from music, science, social studies, industrial arts, reading and mathematics are provided.

Elementary—Volume 1 (Mathematics)
MECC-702, $24.95

The first elementary diskette contains programs to be used in the elementary mathematics classroom. Games of logic such as BAGELS, TAXMAN, and NUMBER, drill and practice programs, such as SPEED DRILL, ROUND, and CHANGE, and programs about the metric system such as METRIC ESTIMATE, METRIC LENGTH, and METRIC 21 are included on the diskette.

Elementary—Volume 2 (Language Arts)
MECC-703, $24.95

The teacher can enter lists of spelling words in the computer and have them used by the program SPELL, which drills students on the spelling, MIXUP which presents the word in mixed up order, or WORD FIND, which will create a word find puzzle for the teacher to duplicate. If words and definitions are entered, a CROSS WORD puzzle can be generated or a WORD GAME can be played. Two other programs included on this diskette are TALK, a program designed to introduce students to the computer or AMAZING which prints out worksheet mazes. Several programs on this diskette use a printer.

Elementary—Volume 3 (Social Studies)
MECC-704, $24.95

The sell series, SELL APPLES, SELL PLANTS, SELL LEMONADE, and SELL BICYCLES which appears on the ELEMENTARY VOLUME 3 diskette can be used to teach elementary economics to students in grades 3-6. CIVIL will reinact battles of the CIVIL war while STATES and STATES2 provide drill and practice on the location of states in the U.S. and their capitals.

Elementary—Volume 4 (Mathematics And Science)
MECC-705, $24.95

Two mathematics programs ESTIMATE and MATHGAME provide reinforcement on estimating and basic facts. Food chains in fish can be studied through ODELL LAKE while ODELL WOODS deals with food chains in animals. SOLAR DISTANCE teaches the concepts or distances in space and URSA provides a tutorial on constellations.

Elementary—Volume 5 (Language Arts)
MECC-719, $24.94

ELEMENTARY—VOLUME 5 deals with the reading concept of prefixes. The diskette contains five lessons which both teach the prefixes of UN, RE, DIS, PRE, and IN. Two review drils, DRAGON FIRE and PRE-APP II, are also contained on the diskette.

Elementary—Volume 6
MECC-725, $24.95

Historical simulations, OREGON, VOYAGEUR and FURS are included in the ELEMENTARY—VOLUME 6 diskette. Along with these programs are NOMAD which teaches map reading and SUMER.

Special Needs—Volume 1 (Spelling)
MECC-727, $24.95

This diskette is designed to drill handicapped students on frequently misspelled primary and intermediate words. Students answer problems by either using the game buttons, the game paddles or any key on the keyboard.

Science—Volume 2 (Senior High)
MECC-709, $24.95

Many of the programs on this diskette were developed by Minnesota teachers. PEST, which deals with the use of pesticides, and CELL MEMBRANE which the user takes the part of a cell membrane, can be used in biology classes. SNELL plots light refraction demonstrating SNELL's law while COLLIDE simulates the collision between two bodies. DIFFUSION deals with the diffusion rates of various gasses, NUCLEAR SIMULATION shows radioactive decay of nine different radioisotopes, ICBM and RADAR teach angles and projections on a coordinate system.

Science—Volume 3 (Middle School)
MECC-707, $24.95

The FISH program through the use of low resolution graphics show the circulatory system of a fish. Simulations like ODELL LAKE which is used to explore food chains, URSA which teaches about constellations, and QUAKES which simulates earthquakes are on the diskette. MINERALS can be used in the area of earth science to identify 29 minerals by having students perform simple tests.

Mathematics—Volume 1 (Senior High)
MECC-706, $24.95

BAGELS, SNARK, ICBM, and RADAR will teach students logic while reinforcing the concepts of plotting prints or angle measurements ALEGBRA provides a drill and practice in solving equations. Three programs on the diskette can be used in plotting equations on a grid: SLOPE which is designed for use in ninth grade with linear functions, POLYGRAPH which will plot any equation on a rectangular coordinate system, and POLAR which graphs functions on polar coordinates.

Aestheometry—Volume 1
MECC-716, $24.95

Aestheometry teaches the topic of curves by viewing curves from two perspectives. The first method demonstrates the "space concepts" of elliptical, parabolic, and hyperbolic curves. Curve sketching designs are developed to provide an aesthetic view of geometric shapes. The second method uses a mathematical approach and defines a curve as the intersection of planes with a cone. The support booklet provides worksheets and classroom ideas.

Teacher Utilites—Volume 1
MECC-715, $24.95

The TEACHER UTILITIES diskette is designed to aid the teacher and would not be used by the student unless the teacher creates questions using the REVIEW program. This program allows the teacher to set up a list of questions which can be used either by the REVIEW program or the TEST GENERATOR program. The teacher can also make CROSS WORD puzzles, WORD FIND puzzles, BLOCK LETTER banners and POSTERS using this program. FREQUENCY and PERCENT can be used to calculate grades and to do statistical analysis. A printer is needed for some of the programs on this diskette.

Programmer's Aid—Volume 1
MECC-720, $32.95

The PROGRAMMER's AID diskette provides help for the programmer. Programs to be able to UPLOAD and DOWNLOAD to the MECC system, programs that work with text files including FP TO TEXT, RANDOM EDITOR, SEQUENTIAL EDITOR, and TEXT LIST along with programs to work with binary files, BINARY FILE INFO, BINARY FILE TO FP are included. Two programs TABLES and MERGE allow the user to create, change and merge graphic shapes for use in a program. FREE SPACE will tell the amount of space on the diskette while HIDDEN CHARACTERS will locate contol character. STARTER will put standard routines such as space bar, music, graphic characters or input into a user's program which is just being created or already created.

MICAS—Volume 1
MECC-721, $32.95

Microcomputer Integrated Computerized Accounting System requires dual disks and 132 characters width printer. The MICAS computerized accounting system provides a realistic experence with automated accounting systems. The package consists of four integrated systems: (1) general ledger, (2) accounts payable, (3) accounts receivable, and (4) inventory control.

Shape Tables—Volume 1
MECC-724, $24.95

The SHAPE TABLES diskette includes 12 files of 187 shapes that can be incorporated in a user's program. Also included are aids needed to work with shape tables.

creative
computing
software

Attn: Faith
Morris Plains, NJ 07950
Toll-free **800-631-8112**
(In NJ 201-540-0445)

Rollercoaster, continued...

Listing 1. Video Adventure. Note that the odd spacing in some of the print statements is for screen formatting. To play without a video interface, change line 40000 to RETURN and change 22000 and 31000 to REM.

To view the video scenes, load Side 1 of the videodisc, Rollercoaster *(MCA Videodisc). The listing was formatted using a program by Kerry Shetline.*

```
    1 GOSUB 30000: REM  INITIALIZE
    2 GOSUB 34000: REM INSTRUCTIONS
    3 GOSUB 22000: REM DISPLAY 1ST ROOM
   10 GOSUB 1000: REM INPUT ROUTINE
   30 IF NOT SPACE THEN
        V$=A$
   40 IF A$=" " THEN 10
   45 PRINT: PRINT
   50 IF ASC(V$)=32 AND LEN(V$)>1 THEN
        V$=RIGHT$(V$,LEN(V$)-1): A$=RIGHT$(A$,LEN(A$)-1): GOTO 50
   60 IF LEN(V$)=LEN(A$) THEN
        NFLAG=0: GOTO 90
   70 N$=RIGHT$(A$,LEN(A$)-LEN(V$))
   80 IF ASC(N$)=32 AND LEN(N$)>1 THEN
        N$=RIGHT$(N$,LEN(N$)-1): GOTO 80
   85 IF N$=" " THEN
        NFLAG=0
   90 A=ASC(V$)-64
  100 IF A<1 OR A>26 THEN 10
  110 ON A GOSUB 10100,10200,10300,10400,10500,10600,10700,10800,10900,11000,
      11100,11200,11300,11400,11500,11600,11700,11800,11900,12000,12100,12200,
      12300,12400,12500,12600
  120 IF NOT KW THEN
        PRINT "I DON'T KNOW HOW TO DO THAT": KW=1
  125 T=T+1:
      IF T>150 THEN
        INVERSE: PRINT "I THINK TIME JUST RAN OUT": NORMAL: T=0: VC$=
        "S16000SXP": GOSUB 40000: GOTO 50000
  130 PRINT: GOTO 10
 1000 A$=" ": SPACE=0: N$=" ": V$=" ": NFLAG=1
 1010 GET B$:
      IF ASC(B$)=13 THEN
        RETURN
 1020 IF ASC(B$)=8 AND SPACE AND RIGHT$(A$,1)=" " THEN
        SPACE=0
 1025 IF LEN(A$)=1 AND B$=" " THEN 1010
 1030 IF ASC(B$)=8 AND LEN(A$)>1 THEN
        A$=LEFT$(A$,LEN(A$)-1): PRINT B$;" ";B$;: GOTO 1010
 1040 IF B$=" " AND NOT SPACE THEN
        V$=A$: SPACE=1: GOTO 1060
 1050 IF ASC(B$)<65 OR ASC(B$)>91 THEN 1010
 1060 PRINT B$;
 1070 A$=A$+B$
 1080 GOTO 1010
 9999 REM FOLLOWING ROUTINES ACT ON THE INPUT. KW IS  KEYWORD FLAG
10100 KW=0: RETURN
10200 IF A$="BREAK BOX" THEN 53000
10210 IF A$="BREAK DOOR" THEN
        PRINT "TOO SOLID TO EVEN TRY": RETURN
10299 KW=0: RETURN
10300 KW=0: RETURN
10400 IF V$="DROP" AND NFLAG THEN 26000
10499 KW=0: RETURN
10500 IF A$="E" THEN
        D=2: GOTO 20000
10501 IF V$="EXAMINE" AND NFLAG THEN 27000
10599 KW=0: RETURN
10600 IF A$="FIND BATTERIES" THEN
        PRINT "TRY THE BEAR": RETURN
10610 IF V$="FIND" THEN
        PRINT "I CAN'T HELP YOU": RETURN
10699 KW=0: RETURN
10700 IF V$="GO" THEN 19000
10710 IF A$="GIVE COINS" AND L=5 THEN 43000
10720 IF A$="GIVE TICKET" AND L=16 THEN 48000
10799 KW=0: RETURN
10800 IF V$="HELP" THEN
        PRINT
        "JUST KEEP MOVING AND EXAMINING THINGS, AND AVOID DANGEROUS PLACES.":
        RETURN
10899 KW=0: RETURN
10900 IF A$="I" OR A$="INV" OR A$="INVENTORY" THEN 24000
10999 KW=0: RETURN
11000 IF V$="JAM" THEN 54000
11099 KW=0: RETURN
11100 IF V$="KILL" THEN
        PRINT "THAT IS BEYOND MY POWER.": RETURN
11199 KW=0: RETURN
11200 IF A$="LOOK" THEN 22000
11210 IF V$="LOOK" AND NFLAG THEN 27000
11299 KW=0: RETURN
11300 IF A$="MAKE JAMMER" THEN 55000
11399 KW=0: RETURN
11400 IF A$="N" THEN
        D=1: GOTO 20000
11499 KW=0: RETURN
11500 IF A$="OPEN BEAR" THEN
        PRINT "TWO BATTERIES JUST FELL ": PRINT "OUT OF THE BACK.": PRINT
        "THEY'RE ON THE GROUND": OB(11)=L: RETURN
11599 KW=0: RETURN
11600 IF (V$="PUT" OR V$="PLACE") AND NFLAG THEN 28000
11610 IF V$="PLAY" AND L=6 THEN 43000
11620 IF V$="PLAY" AND L=16 THEN 48000
11630 IF (A$="PUSH BUTTON" OR A$="PRESS BUTTON") AND L=2 THEN 53000
11699 KW=0: RETURN
11700 IF A$="QUIT" THEN
        END
```

is described and annotated in the accompanying sidebar. Since the idea is fairly simple, and has most likely been developed more than once in the past, I make no claims of great originality here.

The framework handles all the procedures that are common to most adventures. It is, in essence, a gofer, keeping track of a player's moves and the location of objects, and handling common commands such as "GET" and "DROP." By plugging in a couple buckets full of variables, any adventurous realm could be defined. The task of creating a specific adventure now seemed less monstrous (and next year, when they invent the neutrino disc, I'll be able to write a neutrino adventure in record time).

The project requires three-part harmony between an Apple computer, Pioneer Laserdisc player and Aurora interface.

Frame Three: *Onward to Olympus, empathy for hermits, and getting down to the hard stuff.*

I hit the mansion on the hill early one Monday morning, ready to wrestle with technology. The boss flipped a handful of switches, powering up computer, disc player, television, and stereo, while dimming lights throughout the neighborhood. After showing me how to use the interface and disc player, the boss left for the office, and I was on my own. Being alone in someone else's house is a rather strange experience which I will not dwell on here. It should suffice to say that I trod gently so as not to risk breaking the carpet.

The first, and easiest task, was watching the movie. This not only helped pass the time, but gave me a glimpse of scenes that could be used in the adventure. *Rollercoaster*, for those of you who missed the movie, concerns an extortionist who plants bombs on rollercoaster tracks, merry-go-rounds, and other fun places. The movie occupies five sides of three discs. The side used for the adventure contains good

MTU Introduces The Complete Desktop Computer

The MTU-130™ computer is THE COMPLETE 6502 system. This desktop system is designed for people who need to maximize their computing and minimize their learning time. It gives you the features you need to perform your applications.

A desktop computer should have clean expansion beyond the standard system. The MTU-130 is designed with an 18 bit address bus for up to 256K memory (80K standard) and includes an internal card cage for expansion boards or your own custom boards when needed. Of course, the power supply and fan have sufficient capacity for expansion. We even have provided rear panel cutouts for custom connectors if you need them for that special task you have to perform.

The human interface features of this system include: a 96 key keyboard with programmable function keys and displayed soft legends, a bit mapped display with 480 x 256 pixel resolution graphics, 80 column text (gray scale also), an 8 bit audio port for speech, music and sounds, and a high speed (60 points/sec) fiber optic light pen. Other standard I/O includes 2 parallel ports with handshaking and a serial port with software selectable 50-19.2K baud-rates. Of course connectors are provided on the rear panel.

You interact with the MTU-130 through our field proven Channel Oriented Disk Operating System (CODOS) which permits you to easily customize your system. Using CODOS™, any file is transferred from disk to anywhere in memory at a sustained speed of 19.6K bytes/second (not burst speeds!). Files are handled automatically, freeing you to perform at your peak. Auto-execution of "jobs" when power is turned on can turn the MTU-130 into a dedicated-function system. A monitor with 32 commands and 19 utilities is standard. Text or data can be easily transferred to or from other systems on IBM or CP/M* (or others) format disks with our optional DISKEX™ program.

Our standard full screen EDITOR allows you to edit text or program files with rapid positioning anywhere in the file. It edits any file size that fits on the disk (not just in memory) and will edit a file in place or save a backup copy. The concept "what you see on the display is what exists in the file" has been employed which significantly reduces your learning and interacting time. This is a very powerful tool usable by anyone.

If your needs include software development, you will find our optional MOS Technology compatible ASSEMBLER and DISASSEMBLER extremely fast, significantly reducing your development time. For example, a 210K byte source program with 6300 lines and 800 symbols can be assembled in less than 4 minutes. This includes generating the object file and the listing with sorted symbol table and cross reference map on disk. This can be accomplished on a standard 1-drive MTU-130-1S.

If you prefer to program in high level languages, keep in mind that the MTU-130 is RAM-based, not ROM-based, giving you the maximum memory possible for the use with any language. Our version of MICROSOFT BASIC is standard with MTU-130 systems. It allows libraries of commands to be added when needed such as our Virtual (floating point) Graphics. PASCAL and FORTH are planned.

The base standard MTU-130-1S system comes with one single-sided, double-density 8″ floppy disk, a 12″ green phosphor CRT, and MTU-BASIC for $3995. The 3 other models contain 1 or 2 single or double sided drives priced up to $4995 for 2 Megabytes of storage. You can choose an MTU-130 without disk drives, languages or CRT for $2640. 4 Megabyte systems available on request.

We obviously cannot describe fully all of the details of the MTU-130 in this advertisement. If you want to know more about this complete desktop computer, call or write for our complete 28 page descriptive literature. International requests include $5.00 U.S.

COME TO MTU - for excellence in microcomputing systems.

*CP/M is a trademark of Digital Research.

Micro Technology Unlimited
P.O. Box 12106
2806 Hillsborough St.
Raleigh, NC USA 27605
(919) 833-1458

CIRCLE 224 ON READER SERVICE CARD

Rollercoaster, continued...

scenes of carnival rides and explosions, making it highly suitable for an action adventure.

Having checked out the scenery, I started getting acquainted with the interface. The software included a short machine-language driver that could be called from Basic. Instructions went from computer to interface via the USR command. As the videodisc obeyed my commands, I felt like Archimedes lunging from the tub. This was POWER. I was the demigod of the disc, making it fulfill my every whim. It all seemed too easy. I could search for frames, play sequences, switch from computer to video display, do almost anything except make it roll over and beg.

As is the way in life, there was rain on this parade. Since the precipitation occurred later that day, I won't go into it now. With spirits still undampened, I started mapping the adventure, trying to create a scenario that could best exploit the available video. Thanks to the framework, the rooms and objects were plugged in fairly quickly. While the game wouldn't have the magnitude of Crowther and Wood's colossal cave, it would have enough locations to allow the player to get lost once or twice before catching on.

The fusion of computer and videodisc will produce spectacular results.

Frame Four: *The problem with adventures, an emergency guide to dairy substitutes, and the coming of the rain.*

The problem with the average adventure is that it is linear, frustrating and, ultimately, boring. The first one is fun, the second entertaining, but after that the novelty wears thin. I realized I could either put a lot of hard work behind my feelings on the subject and produce a different sort of adventure, or rely on the novelty of the video to save the day. Following the sage advice of Occam's Razor and other convenient laws of laziness, I took the easy way out and stuck with the standard adventure format.

This sort of work definitely called for vast quantities of coffee, which led to the following discovery. If you are ever out of milk and sugar, but have peppermint stick ice cream in the freezer, try some in the coffee. It's not bad.

Having mapped the adventure, I was ready to add some video. As a start, I

```
11799 KW=0: RETURN
11800 IF (A$="READ BOOK") AND (OB(4)=0 OR OB(4)=L) THEN
        PRINT "YOU NOW KNOW HOW TO MAKE A": PRINT "JAMMER FROM A RADIO": BK=1:
        RETURN
11810 IF A$="READ TICKET" THEN
        A$="LOOK TICKET": GOTO 27000
11899 KW=0: RETURN
11900 IF A$="S" THEN
        D=3: GOTO 20000
11910 IF V$="SHOOT" THEN 43000
11920 IF A$="SHOW TICKET" AND L=16 THEN 48000
11999 KW=0: RETURN
12000 IF V$="TAKE" AND NFLAG THEN 25000
12010 IF (A$="TURN KNOB" OR A$="TURN DIAL") AND L=2 THEN 53000
12099 KW=0: RETURN
12100 IF A$="USE JAMMER" THEN 54000
12199 KW=0: RETURN
12200 IF A$="VISIT DANCER" THEN
        PRINT "SHE DOESN'T WANT TO SEE YOU": RETURN
12299 KW=0: RETURN
12300 IF A$="W" THEN
        D=4: GOTO 20000
12310 IF (A$="WEAR UNIFORM") AND (OB(9)=0 OR OB(9)=L) THEN
        VC$="S5890SX": GOSUB 40000:
        FOR I=1 TO 1000:
        NEXT I:
        VC$="X": GOSUB 40000: PRINT "IT FITS WELL AND MAKES A GOOD": PRINT
        "DISGUISE": KW=1: RETURN
12399 KW=0: RETURN
12400 KW=0: RETURN
12500 KW=0: RETURN
12600 POP: STOP: REM DEBUGGING AID.  INPUT OF Z STOPS PROGRAM.
19000 REM  PARSER FOR DIRECTION
19010 D=ASC(N$): D=(D=78)+(D=69)*2+(D=83)*3+(D=87)*4:
      IF NOT D THEN
        PRINT "I NEED A DIRECTION.": RETURN
20000 REM MOVE ROUTINE:D=DIRECTION:R=ROOM MOVED INTO:L=PRESENT LOCATION
20060 R=ASC(MID$(R$(L),D,1))-64
20070 IF NOT R THEN
        PRINT "YOU CAN'T GO THAT WAY": RETURN
20080 L=R
22000 IF RND(1)>.6 AND A$="LOOK" THEN
        VC$="S2550SX":
        FOR I=1 TO LEN(VC$):
          A=USR(ASC(MID$(VC$,I,1))):
          FOR J=1 TO 400:
          NEXT J:
        NEXT I:
        FOR I=1 TO 4000:
        NEXT I:
        A=USR(ASC("X"))
22001 IF V$(L)<>"" THEN
        VC$=V$(L): GOSUB 40000:
        FOR I=1 TO 4000:
        NEXT I:
        V$(L)="": VC$="XZ": GOSUB 40000
22005 PRINT "YOU ARE IN ";
22010 PRINT RM$(L): PRINT RD$(L): PRINT "THIS LOCATION CONTAINS ";: F1=0
22020 FOR I=1 TO NO
22030   IF OB(I)=L THEN
          PRINT OB$(I): F1=1
22040 NEXT I:
      IF NOT F1 THEN
        PRINT "NOTHING"
22050 PRINT "VISIBLE EXITS: ";
22060 FOR I=1 TO 4
22070   IF MID$(R$(L),I,1)<>"@" THEN
          PRINT DIR$(I);"  ";: F1=1
22080 NEXT I:
      IF NOT F1 THEN
        PRINT "DON'T EXIST"
22081 PRINT:
      IF L=5 THEN 41000
22082 IF L=8 THEN 47000
22083 IF L=15 THEN 47100
22084 IF L=18 THEN
        PRINT
        "YOU FOLLOW A WINDING PATH, FINALLY       RETURNING TO FAMILIAR GROUND":
        L=1: GOTO 22000
22085 IF L=9 THEN 49000
22090 RETURN
24000 F1=0: PRINT "YOU ARE CARRYING":
      FOR I=1 TO NO
24010   IF OB(I)=0 THEN
          PRINT OB$(I): F1=1
24020 NEXT I:
      IF NOT F1 THEN
        PRINT "NOTHING"
24030 RETURN
25000 F1=0: F2=0:
      FOR I=1 TO NO
25005   IF N$=OB$(I) AND OB(I)=0 THEN
          PRINT "YOU ALREADY HAVE THE ";N$: RETURN
25010   IF (N$=OB$(I) OR N$="ALL" OR N$="EVERYTHING") AND (OB(I)=(L)) THEN
          OB(I)=0: PRINT OB$(I);" TAKEN": F1=1
25020   IF N$=OB$(I) THEN
          F2=1
```

CLEAR. QUICK. QUIET. ALL THREE, ONLY $1,095.*

You get sharp, easy-to-read printouts. You get them fast, over 150 characters per second, from a printer that's loaded with convenience features.

The Heath/Zenith 25 Printer is a heavy-duty, high-speed, dot matrix printer. It produces up to 300 lines per minute with whisper-quiet smoothness. The entire 95-character ASCII set prints in upper case and lower case with descenders, in a 9 x 9 matrix. All functions and timing are microprocessor-controlled.

The features described below tell only part of the story. You have to see it in action to know how good it really is.

See your telephone white pages for the store nearest you. And stop in today for a demonstration of the Heath/Zenith 25 Printer. If you can't get to a store, send $1.00 for the new Zenith Data Systems Catalog of assembled commercial computers and also receive free the latest Heathkit Catalog. Write Heath Co., Dept. 355-854, Benton Harbor, MI 49022.

HEATH/ZENITH

Your strong partner

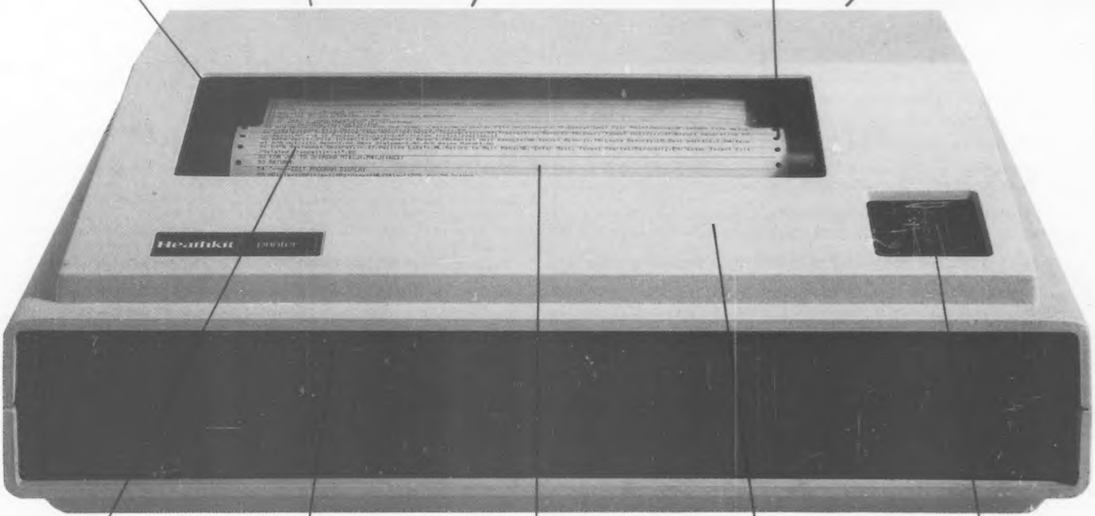
Adjustable tractor-feed width with dual sets of tractors for smooth, bi-directional paper movement. Adjustable vertical and horizontal tabs.

Character pitch is hardware or software-selectable at 10, 12, 13.2 and 16.5 characters per inch, for a maximum of 222 characters per line. That gives you great flexibility in setting up forms.

Standard RS-232C interfacing for compatibility with most systems. Also 20mA current loop serial interface.

Uses standard edge-punched papers in single or multiple forms or fanfold.

Software- or hardware-selectable baud rates at 110, 150, 300, 600, 1200, 4800 and 9600.



Character set includes 33 block graphic characters for charts and graphs.

Heavy-duty construction for reliable operation and long life under daily use.

Convenient cartridge ribbon for quick, no-mess replacement.

Completely enclosed cabinet muffles sound for quiet operation.

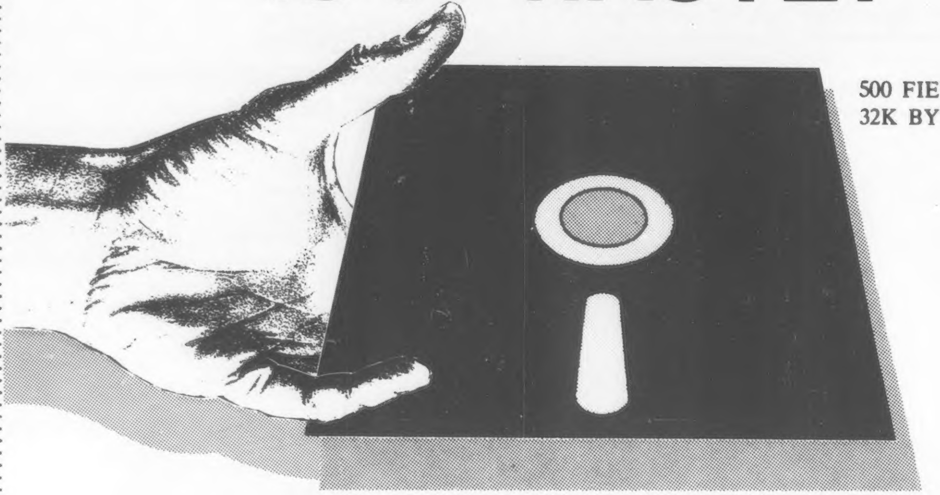
Special detectors tell you when you're out of paper or when paper jams.

---

*In kit form, F.O.B. Benton Harbor, MI. Also available completely assembled and tested at $1,595. Prices and specifications are subject to change without notice.

CP-204C

MORE THAN A HANDFULL IS A WASTE!



500 FIELDS
32K BYTE RECORDS

TITLE: "THE PROGRAM WRITER/REPORTER®"

Enables ANYONE to write complete, running, debugged BASIC LANGUAGE Programs in 35 to 40 minutes with NO PRIOR PROGRAMMING KNOWLEDGE OR ABILITY.

IF you are one of the many who bought a microcomputer in the belief that with just a little studying you could write your own programs, you now know that you can't.

IF you, as a businesman, thought you could have stock software modified at a reasonable cost with reasonable results, you know that's not possible either.

IF you are a hobbyist getting tired of the untold hours it takes to write a program, only to find it takes more hours to debug than to write.

IF you are a skilled programmer you don't have to be reminded of the repetitious time spent on each new application.

IF you have left your micro-computer sitting somewhere gathering dust . . . meet THE PROGRAM WRITER/REPORTER®.

THE PROGRAM WRITER/REPORTER® is not just another data base generator.

THE PROGRAM WRITER/REPORTER®, at your direction, makes complete running programs that are thoroughly documented, easy to modify at any time by YOU!

THE PROGRAM WRITER/REPORTER® cuts programming time up to 90% for a skilled programmer.

THE PROGRAM WRITER/REPORTER® will make anyone a skilled programmer in 30 to 35 minutes!

THE PROGRAM WRITER/REPORTER® does the work! You can answer the simple direct questions and THE PROGRAM WRITER/REPORTER® CREATES. . . AND ALL IN BASIC LANGUAGE.

Q. After THE PROGRAM WRITER/REPORTER® has produced a program, can it be modified?

A. Yes, the resulting program is modular, fully documented and readily accessible for alterations or deletions.

Q. Does the program created use so much disc space that there is very little space left for the record storage?

A. No, the code produced is extremely compact despite complete documentation. If requested THE PROGRAM WRITER/REPORTER® will even "pack" or compress information. You may even delete the "remarks" making it even more space efficient.

Q. Must I be expert or even conversant with Basic Language?

A. No, all questions to and answers from the operator require no computer language knowledge, simple every day English will do.

Q. What about math ability?

A. If you can count your fingers and toes, you'll have no problems.

Q. Will the programs which I produce with THE PROGRAM WRITER/REPORTER® be bulky, slow or amateurish?

A. No, the resulting programs will be sophisticated and extremely fast operating. For example, should you create a mailing list or inventory program, the time for any record to be retrieved and displayed from a full disc would take a maximum of 1 second.

Q. Must the programs produced conform to a pre-determined format and file length?

A. No, you determine format and file size to fit your requirements.

Q. Can I develop my own business programs?

A. yes.

Q. What are the limitations? What programs can I produce with THE PROGRAM WRITER/REPORTER® ?

A. Your own ingenuity and hardware limitations. 100's of different programs.

TECHNICAL ASPECTS

The Reporter Package - makes reports your way.

Record access by a hashing algorithm guaranteeing fast record retrieval.

Duplicate keys permitted.

Record deletion automatically supported.

Record access and file maintenance is user transparent.

Minimal disc overhead since there is no special assembly language routine called. No "Basic" overhead.

Programs produced can be transported between 6800, 6502, 8080, Z80, 8085, 8086 and Z8000 based systems.

Can be used with Micro-Soft Basic and CP/M systems.

Complete file maintenance including up-date of any record in any field, delete and add new records even with duplicate key.

VANLOVES

800-255-5119

Vital
Information Inc. 7899 Mastin Dr. Overland Park KS 66204

CIRCLE 338 ON READER SERVICE CARD

Rollercoaster, continued...

```
25025 NEXT I
25030 IF F1=0 AND F2=0 AND N$<>"ALL" AND N$<>"EVERYTHING" THEN
        PRINT "I CAN'T TAKE THE ";N$: RETURN
25035 IF F1=0 AND F2=0 THEN
        PRINT "THERE IS NOTHING HERE I CAN TAKE."
25040 IF F1=0 AND F2=1 THEN
        PRINT "I DON'T SEE IT HERE."
25060 RETURN
26000 F1=0:
      FOR I=1 TO NO
26010   IF (OB$(I)=N$ OR N$="ALL" OR N$="EVERYTHING") AND (OB(I)=(0))
          THEN OB(I)=L: F1=1
26020 NEXT I
26030 IF NOT F1 THEN
        PRINT "YOU CAN'T DROP WHAT YOU AREN'T CARRYING": RETURN
26040 PRINT "OK": RETURN
27000 F1=0:
      FOR I=1 TO NO
27010   IF (OB(I)=0 OR OB(I)=L) AND (OB$(I)=N$) THEN
          F1=1: PRINT OD$(I):
          IF OD$(I)="" THEN
            PRINT "I SEE NOTHING IMPORTANT.": RETURN
27020   IF (FL(I)=(L) OR FL(I)=0) AND (FR$(I)=N$) THEN
          F1=1: PRINT FD$(I):
          IF FD$(I)="" THEN
            PRINT "NOTHING EXTRAORDINARY HERE": RETURN
27030   IF F1 THEN
          RETURN
27040 NEXT I
27050 PRINT "I CAN'T DESCRIBE THAT"
27060 RETURN
28000 FOR I=1 TO NO
28010   IF N$<>OB$(I) OR OB(I)<>0 THEN
        NEXT I:
        PRINT "YOU AREN'T CARRYING THE ";N$: RETURN
28090 PRINT "WHERE?"
28095 T$=N$
28100 GOSUB 1000
28102 N$=T$
28105 PRINT
28106 IF A$=" DOWN" THEN 26000
28110 IF V$<>" IN" AND V$<>" ON" THEN
        PRINT "I CAN'T DO THAT": RETURN
28115 T$=RIGHT$(A$,LEN(A$)-LEN(V$))
28116 IF LEFT$(T$,1)=" " AND LEN(T$)>1 THEN
        T$=RIGHT$(T$,LEN(T$)-1)
28117 IF T$="FLOOR" OR T$="TABLE" THEN 26000
28120 FOR I=1 TO NO
28130   IF T$<>OB$(I) OR (OB(I)<>L AND OB(I)<>0) THEN
        NEXT I:
        PRINT "THE ";T$;" ISN'T HERE": RETURN
28140 PRINT "OK":
      IF (T$="RADIO" OR T$="JAMMER") AND N$="BATTERIES" THEN
        B=1
28200 RETURN
30000 DIM OB(12),OB$(12),RM$(18),RD$(18),R$(18),OD$(12),FR$(12),FL(12),FD$(12),
      V$(18)
30001 RM$(1)="THE MIDWAY": RM$(2)="THE FIRST AID STATION": RM$(3)="THE MIDWAY":
      RM$(4)="THE MIDWAY": RM$(5)="A RESTAURANT": RM$(6)="A SHOOTING GALLERY"
30002 RM$(7)="A MAINTAINANCE ROOM": RM$(8)="THE BELLY DANCER'S TENT": RM$(9)=
      "THE TOP OF THE ROLLER COASTER": RM$(10)="A CLOSET"
30003 RM$(11)="AN ALLEY": RM$(12)="THE OBSERVATION TOWER": RM$(13)=
      "A CRAWLWAY": RM$(14)="A STORAGE ROOM": RM$(15)="A SMALL SHACK": RM$(16)=
      "A GAME BOOTH": RM$(17)="A NARROW TUNNEL": RM$(18)=
      "A DARK, TWISTING PATH"
30010 R$(1)="EDKC": R$(2)="@JC@": R$(3)="BAFG": R$(4)="@PHA": R$(5)="@@A@":
      R$(6)="C@@@": R$(7)="MCQ@": R$(8)="D@N@": R$(9)="@@M@"
30011 R$(10)="@@@B": R$(11)="A@O@": R$(12)="Q@@@": R$(13)="I@G@": R$(14)=
      "@@@R": R$(15)="K@@@": R$(16)="@@@D": R$(17)="G@L@": R$(18)="@@@@"
30020 L=1: NO=12
30030 OB$(1)="COINS": OB$(2)="TOOLKIT": OB$(3)="TICKET": OB$(4)="BOOK": OB$(5)=
      "LAMP": OB$(6)="TOWELS": OB$(7)="POSTER": OB$(8)="BEAR"
30031 OB$(9)="UNIFORM": OB$(10)="RADIO": OB$(11)="BATTERIES": OB$(12)="JAMMER"
30040 OB(1)=4: OB(2)=7: OB(3)=14: OB(4)=15: OB(5)=-1: OB(6)=-1: OB(7)=-1:
      OB(8)=-1
30045 OB(9)=10: OB(10)=-1: OB(11)=-1: OB(12)=-1
30050 DIR$(1)="NORTH": DIR$(3)="SOUTH": DIR$(2)="EAST": DIR$(4)="WEST"
30060 RD$(1)=
      "WHICH STRETCHES TO THE EAST AND WEST. A RESTAURANT IS TO THE NORTH"
30061 RD$(2)=
      "CONTAINING STRANGE EQUIPMENT. LIGHTS    FLASH FROM AN ELECTRONIC BOX"
30062 RD$(3)=
      "AN AID STATION IS TO THE NORTH. THE     SOUND OF GUNFIRE COMES FROM A SH
      OOTING  GALLERY TO THE SOUTH."
30063 RD$(4)="FROM A TENT TO THE SOUTH YOU HEAR EXOTICMUSIC"
30064 RD$(5)="THE ROOM IS CROWDED BUT YOU SEE AN EMPTYTABLE IN THE CORNER"
30065 RD$(6)="A SIGN READS '3 SHOTS FOR 25 CENTS'"
30066 RD$(7)=
      "THERE ARE DOORS TO THE NORTH AND SOUTH. THE NORTHERN DOOR IS OPEN. YOU C
      AN HEAR THE ROLLER COASTER."
30067 RD$(8)="SHE STOPS AND LOOKS AT YOU"
30068 RD$(9)="A DANGEROUS PLACE TO BE."
30069 RD$(10)="": RD$(11)=
      "THERE IS A DOOR LEADING TO A SMALL ROOM TO THE SOUTH"
30070 RD$(12)=
      "BELOW, YOU CAN SEE THE WHOLE CARNIVAL.  THE TOP OF THE ROLLER COASTER IS
       IN     SIGHT."
```

decided to display a still frame or sequence for each location. I wrote a short parser that would take strings of command codes and send them to the interface. The routine can be found starting at line 40000 in the main program. (If the code at 40000 is replaced with a RETURN, the game can be played without a videodisc, though lack of visuals makes it as exciting as watching salt dissolve.)

Once the visuals were defined, I tried a test run. After giving instructions, the game displayed a scene of the carnival midway. So far, so good. I went east. The disc player whirred. The wrong picture came up. A few tests produced the following realization: the computer is a lot faster than the disc player. If you send commands to search for frame 12345, you might get frame 135. To compensate for this, I added delays to the video parser. Now that the disk had time to digest the whole command, another problem appeared. Commands are not buffered by the interface; they are executed immediately. Sinking into the mind of the disc player, the process goes something like this: *Hey, I gotta search for frame 20123. O.K., I'm on my way. Half-way there. Getting closer. Almost there. Hey, a PLAY command. Here goes.* Thus Mr. Disc doesn't care if the search is finished. The PLAY command takes priority, giving whatever scene was under the beam at that moment. Enter more delay loops. End result: no matter how quickly the main code executes, there are inevitable delays associated with calling frames from the videodisc.

Frame Five: *Meat on the bones, shooting ducks, and an end to modularity.*

With the rooms mapped out and the video stuffed in, the next task was to add all those conditional actions that turn an adventure from a Sunday drive into a real game. In the real world, most problems have more than one solution. In an ideal adventure, any intelligent input should be greeted with an intelligent response. Any attempt to introduce such reality into a program would probably lead to either insanity or an OUT OF MEMORY error. Keeping this in mind, I first added routines to check for any commands that were required for the player to win. Any such input caused the program to jump to the appropriate subroutine. Had all this been planned out beforehand, these subroutines would be neatly organized into meaningful groups. Since I was creating as I went along, the structure of the program suffered somewhat.

> ***To add spice to the game, I tossed in some more video sequences to go along with special actions.***

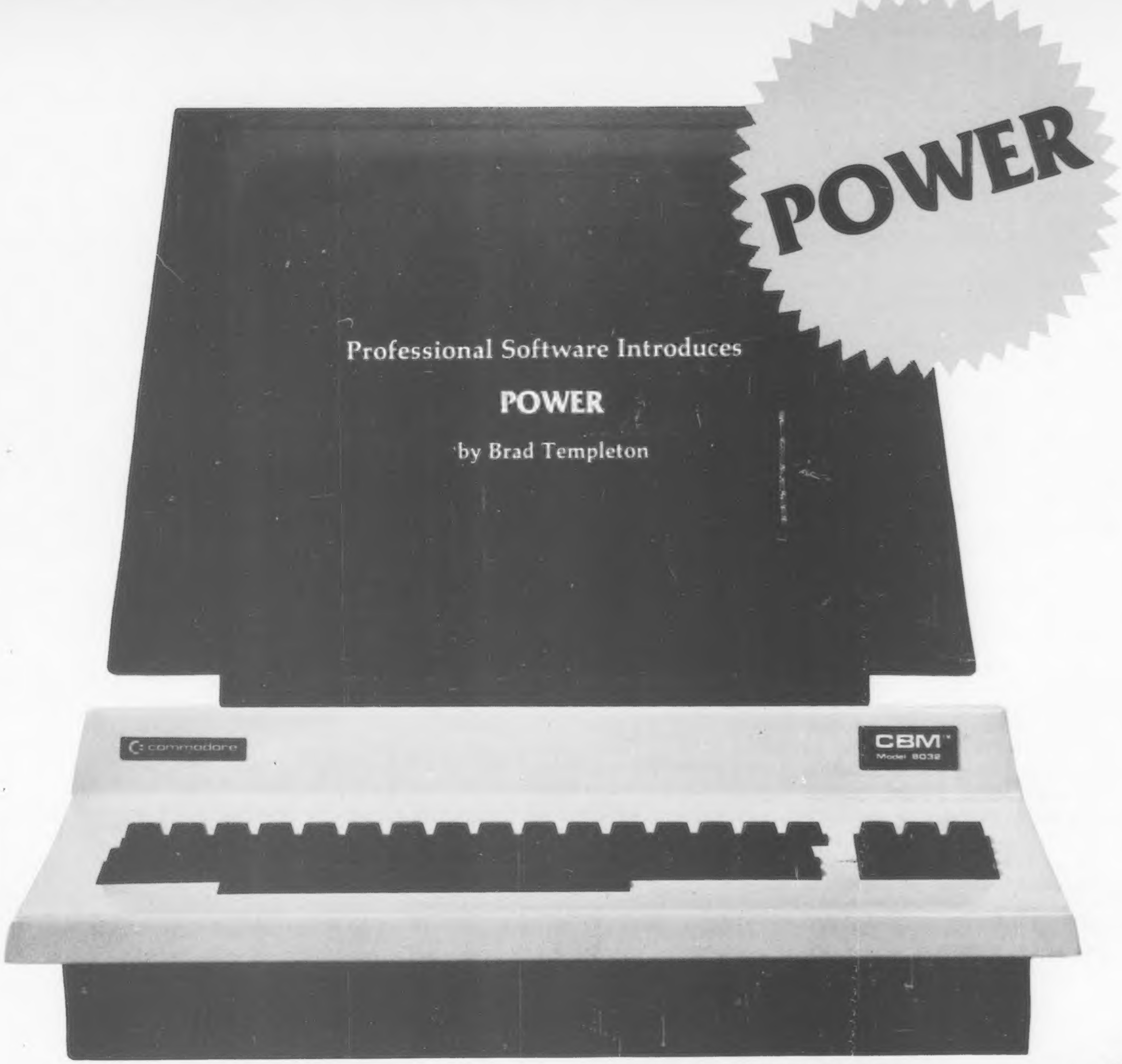
To add a bit of spice to the game, I tossed in some more video scenes to go along with special actions. If the player tries his hand at the shooting gallery, he sees metal ducks being flattened. If he tampers with a certain box, he is rewarded with a view of the rollercoaster being blown off the tracks.

By the end of the second day, the game was approaching finished form. All correct moves were recognized, and some incorrect moves produced special responses. So much for the easy part.

Frame Six: *Error checks, custom changes, and the true meaning of deja vu.*

While the programmer in the role of game creator must try to anticipate various inputs, the programmer in the role of debugger has to create all possible situations. This can be a rather tedious process. Seeing the same scenes over and over is rather akin to drowning. Eventually, self preservation overcame perfectionism, and I decided that all the bugs were eliminated.

```
30071 RD$(13)=
      "THE PASSAGE LEADS NORTH TO THE TOP OF   THE ROLLER COASTER. THE NOISE IS
       QUITE  LOUD"
30072 RD$(14)=
      "THE DOOR IS LOCKED BEHIND YOU, BUT THEREIS A WINDOW TO THE WEST"
30073 RD$(15)=
      "THE ROOM IS LITTERED WITH FRAGMENTS OF  ELECTRONIC PARTS, BUT NONE OF IT
       IS     SALVAGEABLE.  A GUARD BLOCKS YOUR PATH"
30074 RD$(16)="A SIGN SAYS, '50 CENTS A BALL. WINNER'S CHOICE.'"
30075 RD$(17)="THE PASSAGE LEADS SOUTH TO THE TOP OF   THE OBSERVATION TOWER"
30100 OD$(1)="TWO DIMES AND A NICKEL": OD$(2)=
      "IT CONTAINS EVERYTHING NEEDED FOR SMALL ELECTRONIC REPAIRS"
30101 OD$(4)="THE TITLE IS 'RADIO FREQUENCY JAMMING   TECHNIQUES": OD$(5)=
      "IT IS VERY GAUDY": OD$(6)="NICE AND FLUFFY": OD$(7)=
      "WHOOPIE--IT'S THE DALLAS CHEERLEADERS": OD$(8)=
      "WHEN YOU PUSH THE BUTTON ON ITS BACK, ITSAYS 'I WUV YOU'"
30102 OD$(3)=
      "IT SAYS, 'GOOD FOR 1 FREE GAME AT THE   BALL TOSS, COURTESY OF CREATIVE
               COMPUTING, THE #1 MAGAZINE OF SOFTWARE  AND APPLICATIONS.'"
30200 FR$(1)="BOX": FD$(1)=
      "IT IS FIRMLY ATTACHED TO THE TABLE. THERE ARE KNOBS AND A BUTTON ON IT":
      FL(1)=(2)
30201 FR$(2)="RIFLE": FL(2)=6: FD$(2)="IT IS CHAINED TO THE COUNTER"
30202 FR$(3)="GUN": FL(3)=6: FD$(3)="IT IS CHAINED TO THE COUNTER"
30300 V$(1)="S3970SPX": V$(2)="S21130SX": V$(3)="S4500SX": V$(4)="S4750SX"
30310 V$(5)="S23100SX": V$(6)="S11000SX": V$(7)="S14038SPXA": V$(8)=
      "S11790SPX": V$(9)="S15360SXP"
30320 V$(10)="": V$(12)="S8300SPX": V$(13)="S14718SPX": V$(14)="S33900SX":
      V$(15)="S27892SX": V$(16)="S7399SX"
30330 V$(17)="": V$(18)=""
30400 KW=1
31000 IF PEEK(3*256)<>32 THEN
        PRINT "D^BLOAD VIDEO.CODE": POKE 10,76: POKE 11,9: POKE 12,3
32000 RETURN
34000 VC$="S6367S": GOSUB 40000: TEXT: HOME: REM GET TO FIRST VIDEO FRAME AHEAD
       OF TIME. PLAYER SHOULD BE ON BEFORE RUNNING PROGRAM
34001 PRINT "WHAT IS YOUR FIRST NAME?": GOSUB 1000: NA$=A$
34010 PRINT: PRINT "YOU HAVE JUST RECEIVED AN ANONYMOUS": PRINT
      "TIP THAT A BOMB HAS BEEN PLANTED": PRINT "ON A ROLLER COASTER.":
      FOR I=1 TO 1000:
      NEXT I
34011 VC$="S6367S": GOSUB 40000:
      FOR I=1 TO 2000:
      NEXT I:
      VC$="PX": GOSUB 40000:
      FOR I=1 TO 15200:
      NEXT I
34012 VC$="XZ": GOSUB 40000
34015 PRINT: PRINT "YOU ARE CALLED TO INVESTIGATE AND FLY": PRINT
      "OFF TO STOP THE SABOTEUR.":
      FOR I=1 TO 1000:
      NEXT I
34016 VC$="S30030S": GOSUB 40000:
      FOR I=1 TO 6000:
      NEXT I:
      VC$="PX": GOSUB 40000:
      FOR I=1 TO 9000:
      NEXT I
34017 VC$="XZ": GOSUB 40000
34018 PRINT
34020 PRINT "ON HIS SIDE, HE HAS THE BRILLIANCE OF": PRINT
      "AN INSANE MIND, AND THE AID OF ALLIES": PRINT
      "WHO ARE DETERMINED TO SEE THAT YOU FAIL"
34030 PRINT: PRINT "ON YOUR SIDE, YOU HAVE CUNNING, ": PRINT
      "TRAINING, AND DEDICATION"
34055 PRINT: PRINT "YOU HAVE INFILTRATED THE PARK  WITH": PRINT
      "THE KNOWLEDGE THAT THE SABOTEUR": PRINT "WILL STRIKE SOMETIME TONIGHT":
      PRINT: PRINT "ALL YOU NEED DO IS STOP HIM."
34056 PRINT: INVERSE: PRINT "PRESS ANY KEY TO CONTINUE";: GET A$: NORMAL: HOME
34060 PRINT "BY GIVING THE RIGHT COMMAND, YOU CAN ": PRINT
      "MOVE, EXAMINE OBJECTS, AND PERFORM ": PRINT "OTHER ACTIONS"
34070 PRINT "I UNDERSTAND TWO-WORD COMMANDS SUCH AS": PRINT
      "'DROP BOOK' OR 'TAKE KNIFE'.": PRINT
      "TO MOVE, YOU CAN SIMPLY ENTER 'N' FOR": PRINT "NORTH, ETC."
34080 PRINT: PRINT "AT TIMES, I WILL AWAIT YOUR COMMAND": PRINT
      "IN OTHER SITUATIONS, I WILL PRESENT YOU": PRINT
      "WITH A CHOICE OF ACTIONS": PRINT "BUT SUCCESS OR FAILURE IS UP TO YOU."
34090 PRINT: INVERSE: PRINT "PRESS ANY KEY TO BEGIN. MAY LUCK BE": PRINT
      "WITH YOU, ";NA$;: GET A$: NORMAL: PRINT: RETURN
40000 FOR I=1 TO LEN(VC$):
        A=USR(ASC(MID$(VC$,I,1)))
40010   IF MID$(VC$,I,1)="S" AND I>1 THEN
          FOR J=1 TO 6500:
          NEXT J
40020   FOR J=1 TO 400:
        NEXT J:
      NEXT I:
      RETURN
41000 PRINT: PRINT "A WAITER APPROACHES AND ASKS IF YOU": PRINT
      "WOULD LIKE A SEAT": PRINT: PRINT "SINCE YOU MISSED LUNCH TODAY, YOU":
      PRINT "ARE HUNGRY"
41010 PRINT: PRINT "DO YOU WANT TO EAT?": GOSUB 1000
41020 IF A$<>" NO" AND A$<>" YES" THEN
        PRINT "PLEASE ANSWER YES OR NO": GOTO 41010
41025 PRINT
41030 IF A$=" NO" THEN
        PRINT "THE WAITER CALLED YOU A STIFF": PRINT "AND THREW YOU OUT": L=3:
        GOTO 22000
```



ADD POWER TO YOUR COMMODORE COMPUTER

$89.95

POWER produces a dramatic improvement in the ease of editing BASIC on Commodore's computers. POWER is a programmer's utility package (in a 4K ROM) that contains a series of new commands and utilities which are added to the Screen Editor and the BASIC Interpreter. Designed for the CBM BASIC user, POWER contains special editing, programming, and software debugging tools not found in any other microcomputer BASIC. POWER is easy to use and is sold complete with a full operator's manual written by Jim Butterfield.

POWER's special keyboard 'instant action' features and additional commands make up for, and go beyond the limitations of CBM BASIC. The added features include auto line numbering, tracing, single stepping through programs, line renumbering, and definition of keys as BASIC keywords. POWER even includes new "stick-on" keycap labels. The cursor movement keys are enhanced by the addition of auto-repeat and text searching functions are added to help ease program modification. Cursor UP and cursor DOWN produce **previous** and next lines of source code. COMPLETE BASIC program listings in memory can be displayed on the screen and scrolled in either direction. POWER is a must for every serious CBM user.

Call us today, for the name of the Professional Software dealer nearest you.

Professional Software Inc.
166 Crescent Road
Needham, MA 02194
Tel: (617) 444-5224 Telex #951579

Though this is never true, the thought can be comforting. Leaving the message, "Play me," on the diskette sleeve, I packed it in for the day.

I was eager to learn the boss's reaction to the program. "Not bad," he told me the next day, "though I do have a few changes to suggest."

I looked at the three pages of notes, feeling some empathy for the ancient mariner, Sisyphus, and other bearers of long sentences. A close inspection revealed that most of the changes would not be difficult. "I'll take a shot at it," I told him, trying not to give signs of relief.

Back at the fortress, I plugged in the changes and started another round of error checks. By the end of the afternoon, I could close my eyes and see rollercoasters. But the program was finished. In an odd way, the project had almost been fun.

Frame Seven: *Conclusions, the future of video, and the meaning of it all.*

Naturally, there is a post-natal pleasure associated with the completion of any programming task. After the glow dims, some questions remain. Was the project worth doing? Did it accomplish the desired functions? The main goal was to try an experiment with a fairly new technology. Here I feel partial failure. The new medium was used in an old way. Beyond the video scenes, the program is just another adventure. It was as if I had been given Vulcan's forge and used it to produce a souped-up Ford Pinto. Despite the racing stripes and whitewalls, it's still a compact car. But the exercise has convinced me of the potential power of the video-computer connection. The fusion of these two devices will produce some spectacular results. Rather than add to existing concepts, people will create applications that open new areas, merging computers and video rather than just tacking picture to a program. The rollercoaster ride has just begun. □

```
41040 PRINT: PRINT "YOU ARE SERVED A DELICIOUS MEAL": PRINT
      "UNFORTUNATELY, THE SERVICE IS": PRINT "RATHER SLOW": VC$="S19455SPX":
      GOSUB 40000:
      FOR I=1 TO 12000:
      NEXT I:
      VC$="XZ": GOSUB 40000
41045 PRINT
41050 PRINT "THE BOMB WENT OFF AND THE BOMBER ESCAPED":
      FOR I=1 TO 3000:
      NEXT I:
      GOTO 50000
43000 IF OB(1)<>0 THEN
        PRINT "THE MAN BEHIND THE COUNTER TELLS": PRINT
        "YOU, 'IF YOU WANNA PLAY YOU GOTTA PAY.'": RETURN
43010 PRINT "YOU HAND OVER THE COINS AND PICK": PRINT "UP THE GUN": OB(1)=-1
43020 VC$="S11024SXP": GOSUB 40000:
      FOR I=1 TO 3000:
      NEXT I:
      VC$="XZ": GOSUB 40000
43030 PRINT "GOOD SHOOTING": PRINT "HE HANDS YOU A TEDDY BEAR": OB(8)=0
43035 PRINT "A PASSERBY LOOKS AT THE BEAR AND": PRINT
      "SAYS, 'MODERN NONSENSE. WHAT EVER       HAPPENED TO SIMPLE STUFFED ANIMA
      LS?'": PRINT "HE SHAKES HIS HEAD AND LEAVES."
43040 RETURN
47000 PRINT:
      IF OB(8)<>0 THEN
        PRINT "SHE SAYS YOU CAN'T COME IN UNLESS YOU HAVE A PRESENT FOR HER":
        PRINT "SHE PUSHES YOU OUT.": L=4: GOTO 22000
47005 IF OB(8)=-2 THEN
        PRINT
        "SHE SAYS, 'YOU THINK ONE PRESENT ENTITLES YOU TO COME IN HERE ANY TIME
         YOU WANT?'": PRINT "SHE TURNS HER BACK AND IGNORES YOU.": RETURN
47010 PRINT "SHE LETS YOU IN AND EYES THE BEAR.": PRINT
      "DO YOU WANT TO GIVE IT TO HER? ": GOSUB 1000
47020 PRINT:
      IF A$<>" Y" AND A$<>" YES" THEN
        PRINT "SHE THROWS YOU OUT": L=4: GOTO 22000
47030 OB(8)=-2: PRINT "SHE UNLOCKS THE DOOR TO THE SOUTH"
47040 RETURN
47100 IF OB(9)<>0 THEN
        PRINT "HE SAYS, 'EMPLOYEES ONLY' AND THROWS YOU OUT": L=11: GOTO 22000
47110 PRINT "HE SEES YOUR UNIFORM AND LETS YOU IN"
47120 RETURN
48000 IF OB(3)<>0 THEN
        PRINT "YOU CAN'T AFFORD THE GAME": RETURN
48010 PRINT "YOU HAND OVER THE TICKET AND THROW THE  BALL.": PRINT "G^G^G^":
      PRINT "IT'S A WINNER.": PRINT "YOU HAVE A CHOICE OF FOUR PRIZES:"
48020 PRINT "A LAMP, TOWELS, RADIO, OR POSTER."
48030 PRINT "WHICH DO YOU WANT?": GOSUB 1000
48040 A$=RIGHT$(A$,LEN(A$)-1):
      FOR I=5 TO 10
48050   IF OB$(I)=A$ THEN
          OB(I)=0: PRINT: PRINT "IT'S YOURS":
          IF A$="RADIO" THEN
            VC$="S1234SX": GOSUB 40000:
            FOR I=1 TO 1000:
            NEXT I:
            VC$="X": GOSUB 40000: RETURN
48060 NEXT I:
      PRINT: PRINT "PLEASE ANSWER WITH LAMP, RADIO OR TOWEL.": GOTO 48030
49000 INVERSE: SPEED=200: PRINT "IF YOU LOOK BACK, YOU'LL NOTICE": PRINT
      "A CAR SPEEDING TOWARD YOU": VC$="S16000SXPAAXZ"
49010 NORMAL: SPEED=255: GOSUB 40000: GOTO 50000
50000 HOME: VTAB 10: PRINT "IT IS ONE YEAR LATER": PRINT
      "THE ROLLER COASTER HAS BEEN REBUILT": PRINT
      "THE SABOTEUR PLANS TO DESTROY IT AGAIN": PRINT
      "WOULD YOU LIKE TO TRY TO SAVE IT?"
50010 GOSUB 1000: PRINT
50020 IF A$=" YES" OR A$=" Y" THEN
        GOSUB 30001: GOTO 22000
50030 IF A$<>" N" AND A$<>" NO" THEN
        PRINT "YES OR NO";: GOSUB 1000: PRINT: GOTO 50020
50040 END
53000 PRINT "UH OH, I THINK THAT WAS A MISTAKE": VC$="S18722S2SXPAAAAXZ": GOSUB
      40000: PRINT "YOU SET OFF THE BOMB":
      FOR I=1 TO 2000:
      NEXT I:
      GOTO 50000
54000 IF L<>12 THEN
        PRINT "YOU AREN'T IN LINE OF SIGHT WITH": PRINT "THE ROLLER COASTER":
        RETURN
54010 IF OB(12) THEN
        PRINT "YOU DON'T HAVE A JAMMER": RETURN
54020 IF NOT B THEN
        PRINT "IT DOESN'T WORK. MAYBE IT NEEDS BATTERIES": RETURN
54030 VC$="S12190SPX": GOSUB 40000:
      FOR I=1 TO 8000:
      NEXT I:
      VC$="XZ": GOSUB 40000
54040 HOME: VTAB 10: HTAB 12: INVERSE: SPEED=100: PRINT "CONGRATULATIONS":
      NORMAL: PRINT: HTAB 6: PRINT "YOU SAVED THE ROLLER COASTER": SPEED=255:
      END
55000 IF NOT BK THEN
        PRINT "YOU DON'T KNOW HOW": RETURN
55010 IF OB(10)<>0 THEN
        PRINT "SOMETHING VITAL IS MISSING": RETURN
55020 IF OB(2)<>0 THEN
        PRINT "YOU DON'T HAVE THE REQUIRED TOOLS": RETURN
55030 PRINT "CONGRATULATIONS, YOU NOW HAVE A ": PRINT "JAMMER": OB(10)=-1:
      OB(12)=0: RETURN
```

Now it can be Revealed GBS The business software that solves problems your way.

So useful and adaptable it's like having an Award Winning programmer on staff.

What is GBS?

GBS is both a powerful, relational data base management system . . . and, more importantly, a very powerful applications development tool. As such, it can deliver programs that match **your** specific business requirements . . . not just those of the average business. The final result is increased productivity now and in the future.

Surprisingly Easy to Use

GBS has been honed and refined for two years, so it meets the needs of the user who wants programs that work without a lot of computerese! To that end, GBS operates with a simplified **fill-in-the-blanks** approach. The user merely fills in blanks and GBS does the rest . . . acting like an in-house programming whiz!

Since you need know **only 15 instructions** to utilize the full scope of GBS you should be able, after studying our exceptional documentation for a few hours, to develop your own business programs . . . general ledger, inventory control, order entry, job costing and more.

Relational Data Base

Management of business records is a must for profitability. GBS handles it for you with unbelievable accuracy, speed and ease. For example, three data files of up to 64 thousand records and 1 million characters can be concurrently in use . . . and multiple indexes fully maintained (yes, fully maintained!). GBS . . . truly the quality solution in business software.

GBS
THE QUALITY SOLUTION

Only $700. On disk, including documentation.
Requires CP/M*

Dealer and distributor inquiries invited.

QUALITY SOFTWARE
6660 Reseda Blvd., Suite 105
Reseda, Calif. 91335
(213) 344-6599

QS

CIRCLE 194 ON READER SERVICE CARD

*CP/M is a trademark of Digital Research.

Dark Forest
BEER
RUN
OLYMPIA
SIRIUS
OLYMPIA

Bright New Stars From Sirius Software

DARK FOREST: The age was dark, the forest was dark and the Gruds were everywhere ... Three of your kingdom's most valued treasures are missing and you must comb the countryside to recover them. An adventurous game of strategy and conquest for up to six players.

BEER RUN: is a light-headed game of suspense. Can you catch the Artesians™ before the Guzzlers and Bouncers catch you? Enter the Sirius Building and find out!!!

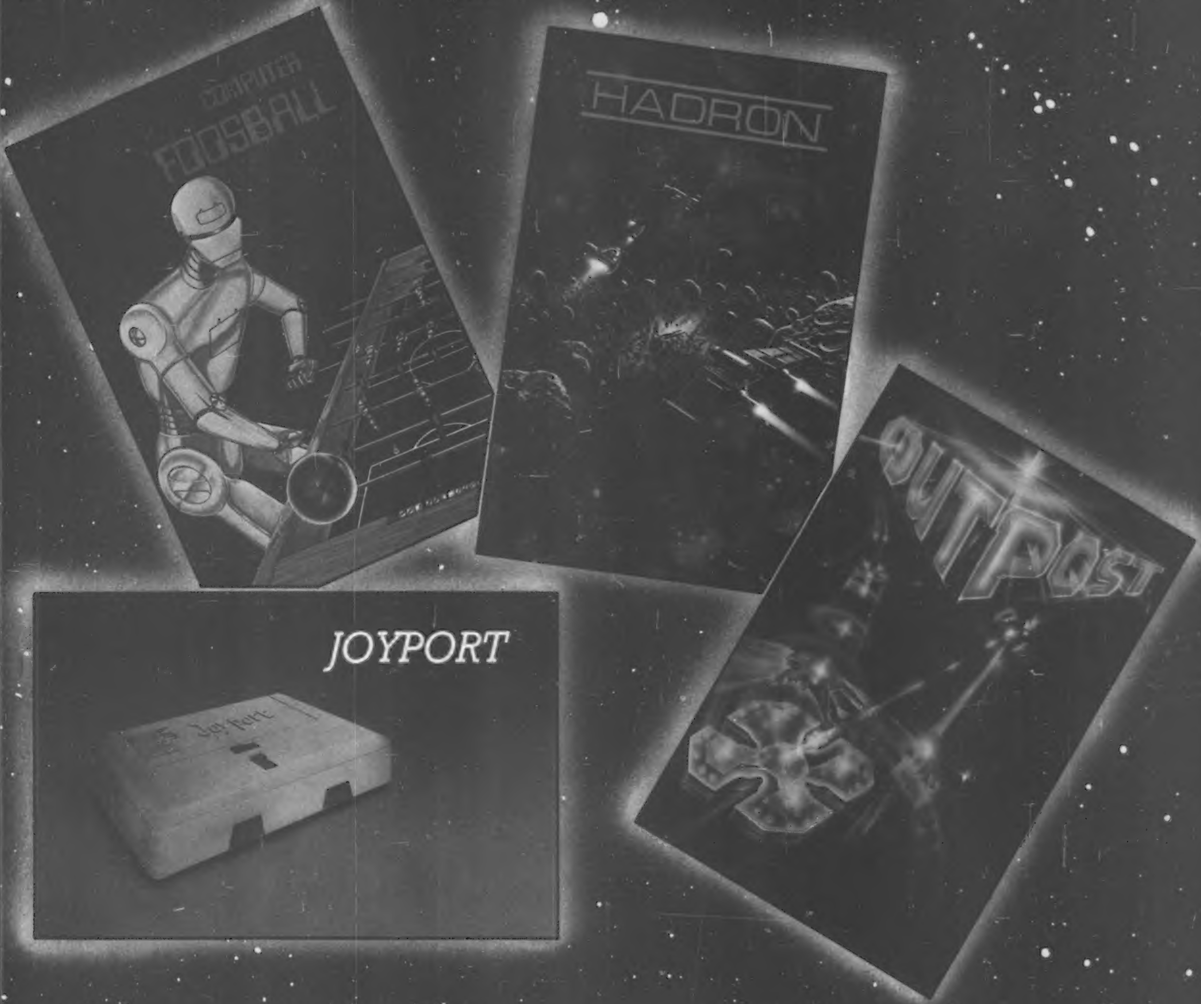
COMPUTER FOOSBALL: A fast action electronic version of this favorite table game. You and up to three friends can play this hires game using the new JOYPORT.

Coming Attractions . . .

AUDEX: Create sounds, shape them, edit them and play them back in your own programs. The only tools required are your Apple II keyboard, screen and an optional tape player.

BORG: Can you out run and out shoot the dragon's henchmen? Watch out for the wrath of Borg if you do!

LeGREEDY: So you always wanted to play the real estate game but couldn't afford to ... Find out how much of LeGreedy is in you.



JOYPORT: Expand the Apple II game paddle port to handle up to four Apple type game paddles and two Atari joysticks. Four Apple game paddles can be read sequentially under software control. Comes in attractive impact resistant case.

HADRON: You are a fighter patrol in space. You are trying to follow an enemy drone ship back to its home base. To get there you must successfully negotiate a dense meteor field and duck fire from the base. Exciting 3-D play.

OUTPOST: Alone in a space outpost you've been attacked from all sides by enemy fighters. You must use your propulsion units and shields to ward off the attackers. A fast reflex action game.

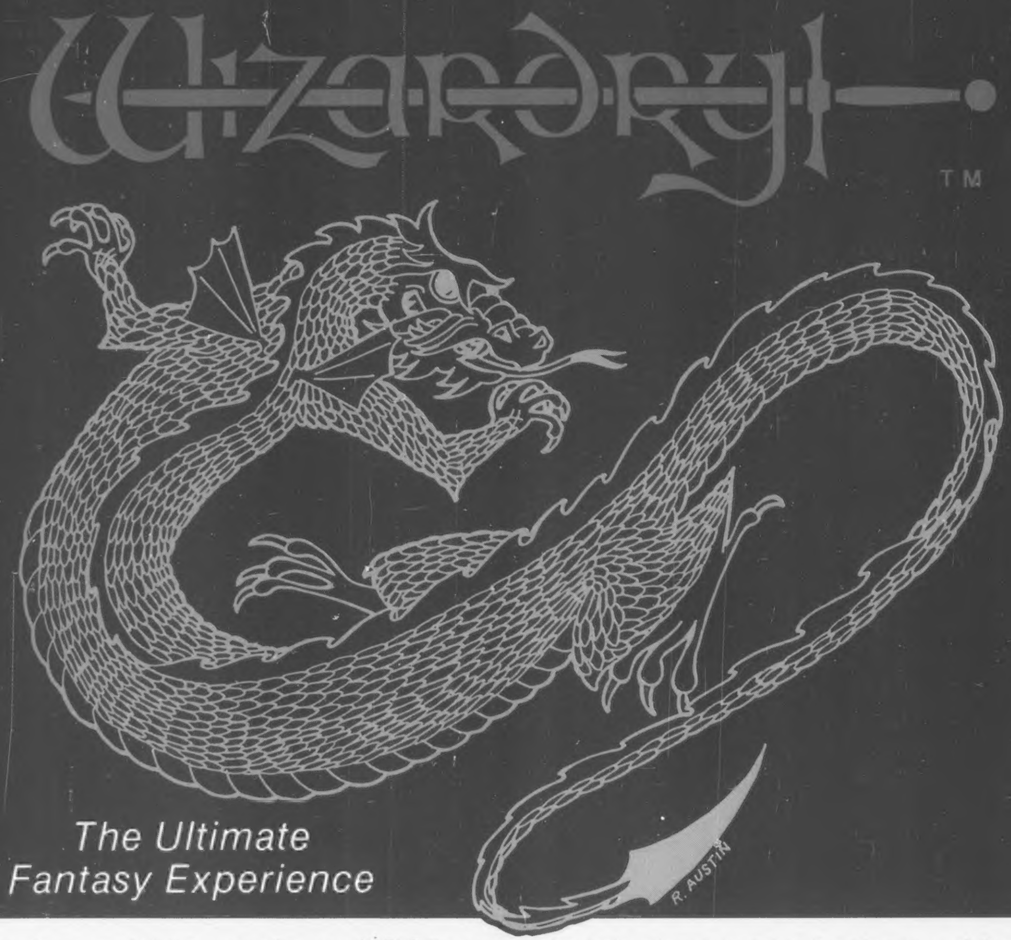
Sirius Software, Inc.
10364 Rockingham Drive Sacramento, California 95827

COPYRIGHT INFORMATION: All software mentioned in this advertisement are copyrighted products of Sirius Software, Inc. All rights are reserved. Apple and Applesoft are registered trademarks of Apple Computer, Inc. Higher Text is a copyrighted product of Synergistic Software. Oly and Artesians are trademarks of Olympia Brewing Co. Atari is a registered trademark of Atari, Inc. We use Control Data disks for highest quality.

All products are designed for use with Apple II computers.

CIRCLE 238 ON READER SERVICE CARD

Are you ready to step into the world of



Wizardry—a revolutionary game for your APPLE II computer. Never before has a game done so much, so well, so fast! Groups of up to 6 adventurers explore a deep and mysterious maze in search of loot and glory. Brawny fighters, frail mages, nimble thieves, all must cooperate to survive. Not only must you battle hordes of monsters, but you must also solve the secret riddles hidden in the mazes. Starting from the safety of the castle, you must map the 3D maze as you move through it, swiftly running down the corridors and smashing through doors! Suddenly you encounter a group of monsters in their hideous lair! Leaping to the attack, swords swinging, your fighters wreak havoc amongst the monsters! Mages utter spells, causing destruction! Thieves skulk around in the corners, and priests attempt to bring the blessings of the gods upon your party! After the melee, there may be a chest to open, traps to evade, and loot to be divided!

A partial list of Wizardry features includes—A 10 level maze—8 character classes—5 races—20 stored on disk—3D maze display—complete castle—hundreds of monsters and magic items—monsters appear in mixed groups—50 castable spells, usuable by players, magic items and even monsters—44 page illustrated manual and much, much more all for $49.95 (N.Y. residents add sales tax).

But don't take our word for it, *Wizardry* received reviews in the May issue of *Creative Computing*, the April issue of *Popular Mechanics*, page 38, and the August issue of *Softalk* magazine.

At Leading Computer Stores Everywhere

Sir-tech **SOFTWARE, INC.** Dept. G
6 Main Street / Ogdensburg, New York 13669 / (315) 393-6633

VISA

Apple is the registered trademark of APPLE COMPUTER, INC.

MasterCard

CIRCLE 332 ON READER SERVICE CARD

An Adventure Framework

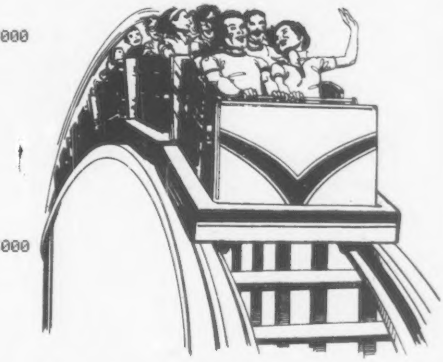
There are two key parts to the framework; the input routine and the partial parser. Rather than use an INPUT statement, each character is obtained with GET. This has several advantages. First, each character can be checked on entry. Second, commas won't cause an EXTRA IGNORED error message. Finally, there is plenty of time between each character to process the preceding one. With INPUT, the program receives the whole phrase at once and any processing has to be done after the user has hit return. To separate a two-word phrase, the program would have to search through the input string for a space, adding to the delay time. On the other hand the GET routine can immediately identify a space and define anything prior to it as the first word of input. The rest of the routine just traps illegal characters and checks for controls such as the back arrow or return. For back arrows, the routine erases characters as the cursor crosses them.

The input routine accepts one or two words, but no more. In its present form, it accepts only letters. It could be easily modified to recognize other characters if required. Upon returning from the input routine, there is a horrendous ON A GOSUB command with twenty-six parameters for the variable A. This causes the program to branch to different lines depending on the first letter of the command. While such a solution might be considered inelegant, it cuts down the delay considerably. Once the branch has been made, the program has just a few possible keywords for which to check.

Next, I took the basic concepts encountered in an adventure (moving, picking up and dropping objects,

Listing 2. Adventure Framework. This is not *a playable game as is. It is a framework handling common Adventure features.*

```
    1 GOSUB 30000: REM  INITIALIZE
    2 TEXT: HOME
    3 GOSUB 22000
    4 HTAB 1
   10 GOSUB 1000
   30 IF NOT SPACE THEN
        V$=A$
   40 IF A$=" " THEN 10
   45 PRINT: PRINT
   50 IF ASC(V$)=32 AND LEN(V$)>1 THEN
        V$=RIGHT$(V$,LEN(V$)-1): A$=RIGHT$(A$,LEN(A$)-1): GOTO 50
   60 IF LEN(V$)=LEN(A$) THEN
        NFLAG=0: GOTO 90
   70 N$=RIGHT$(A$,LEN(A$)-LEN(V$))
   80 IF ASC(N$)=32 AND LEN(N$)>1 THEN
        N$=RIGHT$(N$,LEN(N$)-1): GOTO 80
   85 IF N$=" " THEN
        NFLAG=0
   90 A=ASC(V$)-64
  100 IF A<1 OR A>26 THEN 10
  110 ON A GOSUB 10100,10200,10300,10400,10500,10600,10700,10800,10900,11000,
      11100,11200,11300,11400,11500,11600,11700,11800,11900,12000,12100,12200,
      12300,12400,12500,12600
  120 PRINT
  130 PRINT: GOTO 10
 1000 A$=" ": SPACE=0: N$=" ": V$=" ": NFLAG=1
 1010 GET B$:
      IF ASC(B$)=13 THEN
        RETURN
 1020 IF ASC(B$)=8 AND SPACE AND RIGHT$(A$,1)=" " THEN
        SPACE=0
 1025 IF LEN(A$)=1 AND B$=" " THEN 1010
 1030 IF ASC(B$)=8 AND LEN(A$)>1 THEN
        A$=LEFT$(A$,LEN(A$)-1): PRINT B$;" ";B$;: GOTO 1010
 1040 IF B$=" " AND NOT SPACE THEN
        V$=A$: SPACE=1: GOTO 1060
 1050 IF ASC(B$)<65 OR ASC(B$)>91 THEN 1010
 1060 PRINT B$;
 1070 A$=A$+B$
 1080 GOTO 1010
10100 RETURN
10200 RETURN
10300 RETURN
10400 IF V$="DROP" AND NFLAG THEN 26000
10499 RETURN
10500 IF A$="E" THEN
        D=2: GOTO 20000
10501 IF V$="EXAMINE" AND NFLAG THEN 27000
10599 RETURN
10600 RETURN
10700 IF V$="GO" THEN 19000
10799 RETURN
10800 RETURN
10900 IF A$="I" OR A$="INV" OR A$="INVENTORY" THEN 24000
10999 RETURN
11000 RETURN
11100 RETURN
11200 IF A$="LOOK" THEN 22000
11210 IF V$="LOOK" AND NFLAG THEN 27000
11299 RETURN
11300 RETURN
11400 IF A$="N" THEN
        D=1: GOTO 20000
11499 RETURN
11500 RETURN
11600 RETURN
11700 RETURN
11800 RETURN
11900 IF A$="S" THEN
        D=3: GOTO 20000
11999 RETURN
12000 IF V$="TAKE" AND NFLAG THEN 25000
12099 RETURN
12100 RETURN
12200 RETURN
12300 IF A$="W" THEN
        D=4: GOTO 20000
12399 RETURN
12400 RETURN
12500 RETURN
12600 POP: STOP: REM DEBUGGING AID. INPUT OF Z STOPS PROGRAM
19000 REM PARSER FOR GO DIRECTION
19010 D=ASC(N$): D=(D=78)+(D=69)*2+(D=83)*3+(D=87)*4:
      IF NOT D THEN
        PRINT "I NEED A DIRECTION.": RETURN
20000 REM MOVE ROUTINE:D=DIRECTION:R=ROOM MOVED INTO:L=PRESENT LOCATION
20060 R=ASC(MID$(R$(L),D,1))-64
20070 IF NOT R THEN
        PRINT "YOU CAN'T GO THAT WAY": RETURN
20080 L=R
22000 REM LOOK ROUTINE
22005 PRINT "YOU ARE IN ";
22010 PRINT RM$(L): PRINT RD$(L): PRINT "THE ROOM CONTAINS ";: F1=0
22020 FOR I=1 TO NO
22030   IF OB(I)=L THEN
          PRINT OB$(I): F1=1
```

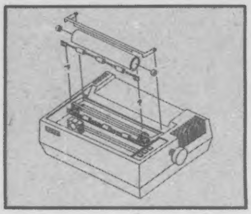


Unbeatable prices......

Orange Micro

EPSON PRODUCTS

MX 80/70 FRICTION FEED KIT by Orange Micro



HERE AT LAST! A friction feed kit for your EPSON MX 80/70. The kit allows the user to convert his Epson printer to a friction feed and pin feed mechanism.

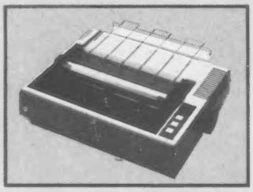
The friction feed will accept single sheets of your letterhead, or multiple copy forms such as invoices with up to 4-part carbon copies.

The pin feed replaces the adjustable sprocket mechanism. It allows use of 9½" wide continuous fanfold paper which is an industry standard size.

No drilling required. Installation takes about 30 minutes. All parts are included with easy to follow instructions. $75.00. DEALER INQUIRIES INVITED.

EPSON MX 80/MX 80 FT

9 x 9 dot matrix · Lower case descenders · 80 CPS · Bi-directional, logic seeking · 40, 66, 80,132 columns per line · 64 special graphic characters · TRS-80 Compatible · Form handling · Multi-page printing · Adjustable tractors

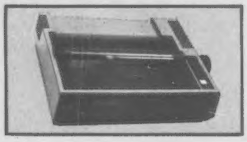


MX 80....(List $645) $ Call

Graftrax-80 Dot Graphics Upgrade...(List $95) $ Call

MX 80 FT includes Friction Feed............................(List $745) $ Call

EPSON MX 70



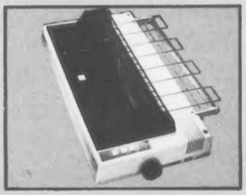
Super low-priced dot resolution graphics · 5 x 7 dot matrix · User replaceable printhead & Top of Form

MX 70....(List $450) $ Call

EPSON MX 100

Same basic features as the MX 80 · PLUS friction feed for single sheets · PLUS 15" wide carriage

MX 100...(List $995) $ Call



LETTER QUALITY PRINTERS

C. ITOH STARWRITER

Daisy Wheel Letter Quality 25 CPS (Optional 45 CPS) · Typewriter quality · Centronics parallel · RS 232 Serial (Optional) · Proportional spacing · Bi-directional · Programmable VFU · Self test · Diablo compatible · Friction feed (Optional tractors) · 136 printable columns · Manufactured by TEC

C. ITOH STARWRITER............(List $1895) $ Call

NEC SPINWRITER

High Speed Letter Quality · 55 CPS · Typewriter quality · Bi-directional · Plotting & Proportional spacing

77XX RO, Serial/Parallel ....(List $3055) $2575

QUME 9/45 typewriter quality................ $ Call

DIABLO 630 typewriter quality............... $ Call

NEW NEC 8023 DOT MATRIX

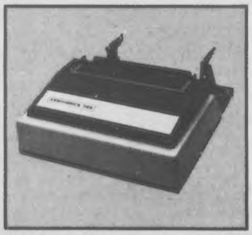
Dot graphics · 100 CPS · Bi-directional, logic-seeking · Tractors & friction feed · 5-Alphabet fonts · 8 character sizes · Proportional spacing

NEC 8023 DOT MATRIX ....(List $795) $ Call

TELEVIDEO CRT'S

TVI910, TVI912C, TVI920C, TVI950—Please call toll free. Prices are too low to advertise........ $ Call

CENTRONICS 739



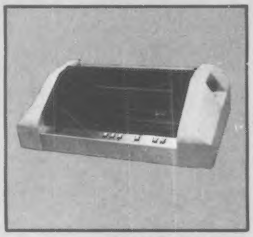
With graphics and word processing Print Quality · 18 x 9 dot matrix; suitable for word processing · Underlining · proportional spacing · right margin justification · serif typeface · 80/100 CPS · 9½" Pin Feed/Friction feed · Reverse Platen · 80/132 columns · Top of Form

CENTRONICS 739-1 (Parallel)........(List $955) $Call
CENTRONICS 739-3 (Serial).........(List $1045) $815

....technical expertise.

The printer specialists.

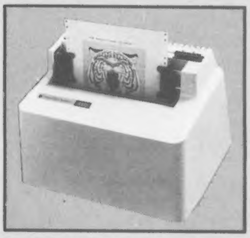
ANADEX



Dot Graphics, Wide Carriage · 11 x9 dot matrix; lower case descenders · Dot resolution graphics · Bi-directional, logic seeking · Up to 200 CPS · RS 232 Serial & Parallel · Forms control · X-ON/X-OFF · Up to 6 part copy.

ANADEX 9501	(List $1650) $1350

IDS PAPER TIGERS



Dot Resolution Graphics, quality print, speed 9 wire staggered printhead with lower case descenders · Over 150 CPS · Bi-directional, logic seeking · 8 character sizes; 80-132 columns · Adjustable tractors · High-resolution dot graphics · Proportional spacing & text justification

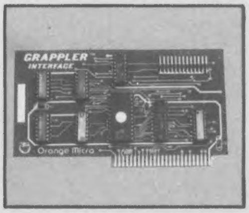
IDS 460G	(List $1094) $ Call
IDS 560G	(List $1394) $ Call

INTERFACE EQUIPMENT

CCS APPLE SERIAL Interface & Cable	$150
ORANGE INTERFACE for Apple II parallel interface board & cable	$110
TRS-80 CABLES to keyboard or Exp. Interface	$ Call
NOVATION D-CAT direct connect modem	$ Call
ATARI, NORTHSTAR printer cables	$ Call
ALL EPSON ACCESSORIES	$ Call

THE GRAPPLER™

APPLE INTERFACE AND CABLE by Orange Micro



The Grappler™ interface card is the first to provide on-board firmware for Apple high resolution dot graphics. No longer does the user need to load clumsy software routines to dump screen graphics—it's all in a chip. Actually, it's our E-PROM, and it is replaceable to accommodate the Anadex, Epson MX-70, 80* and 100, IDS Paper Tigers, Centronics 739, NEC 8023, C. ITOH Prowriter, and future graphic printers. The Grappler™ accepts 18 software commands including Hi-Res inverse, 90° rotation, double size, and much more. Invented by, and available from Orange Micro and Orange Micro dealers only. $ Call for price.

*Requires GRAFTRAX 80

VISIT OUR RETAIL STORES

If you live in California, or are visiting don't miss our two Printer Stores. Expert consultation and know-how is available to assist you in getting the best printer for the application. We provide live demonstrations for a wide selection of Printers.

13604
Orange Micro
PRINTER STORE
OPEN

SHERMAN OAKS, 13604 Ventura Blvd., (213) 501-3486
ANAHEIM, 3150 E. La Palma, Suite I, (714) 630-3622
Store Hours: M-F 10-6, Sat. 10-4

At Orange Micro our printer specialists fit the right printer to your application. Call us today for free consultation (and don't forget to ask for your free catalog).

Phone orders are WELCOME; same day shipment. Free use of VISA and MASTERCARD. COD's accepted. Personal checks require 2 weeks to clear. Manufacturers warranty included on all equipment. Prices subject to revision.

CALL FOR FREE CATALOG
TOLL FREE (800) 854-8275

CA, AK, HI (714) 630-3322.

master charge VISA AMERICAN EXPRESS

Orange Micro inc.

3150 E. La Palma, Suite G, Anaheim, CA 92806

Copyright ©1981 by Orange Micro, Inc.

CIRCLE 250 ON READER SERVICE CARD

Framework, continued...

examining objects, and looking at a location), and designed the framework in such a way that objects and rooms could be changed with little effort. For movement, I limited the program to four directions; adding up and down would be easy if required later. The rooms were given two identifiers, a number from 1 to 26 and the corresponding letter of the alphabet. For each room, there is a string containing the rooms that can be reached by going north, east, south, and west. Disallowed directions are marked by a null character. This information, stored in an array called RS, serves not only to determine where a person would end up, but also for printing visible exits.

There are two other string arrays associated with rooms. The RM$ array contains a brief description of each room. RD$ contains a complete description. By separating them, it is possible to print a full description the first time a person enters a room, and a short description if he returns. (I ended up printing the full description each time since most weren't that long.)

Objects are also held in an array, OB$, and another array OB, contains the location of each object. OB holds either a room number, a zero if the person has the object, or a negative number if the object is out of play. This is the same sort of technique used in most Basic adventures.

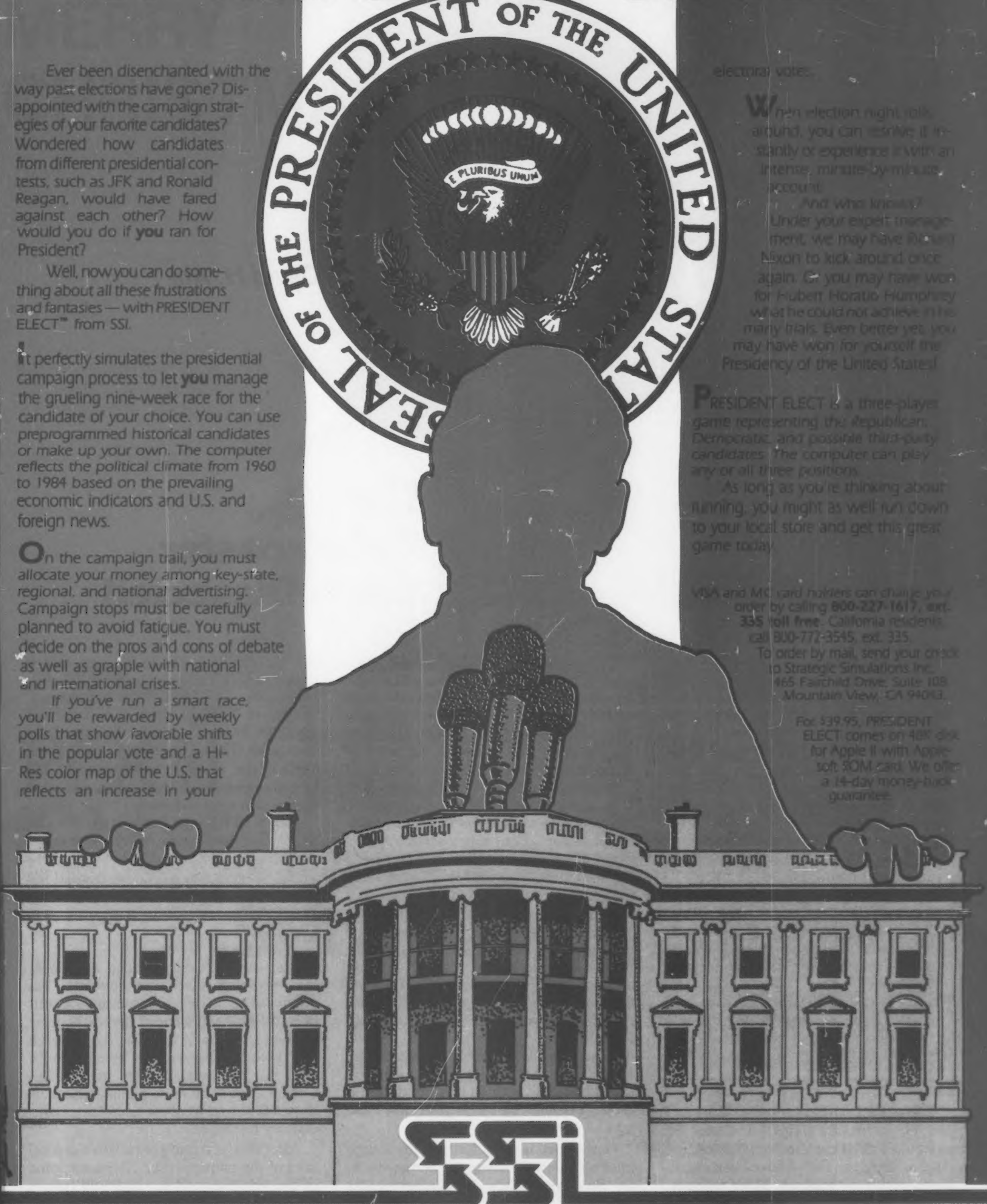
One further concept was the use of variables for what I consider "furniture." This would cover objects that can't be taken but can be examined. Furniture is contained in the array FR$, its description is in FD$, and FL contains its location. If the value of FL is zero, that furniture can occur in any location. For example, if all rooms have walls, FR$ would be WALL, FD$ might be "IT IS MADE OF STONE AND CONTAINS NO CRACKS OR MARKINGS" and FL would be 0. Since the routines for LOOK and TAKE check through both objects and furniture, these two sets of arrays must have the same value, even if the higher numbers of one set aren't used.

The rest is reasonably straightforward. Once rooms and objects have been taken care of, routines need only be added to handle special situations. Note that the LOOK routine checks to see whether an object is either in the player's possession or in the same room as he. This avoids the frustration encountered when a player wants to examine something and is told he isn't carrying it. The general framework, with dummy room and object definitions, is given in Listing 2 or those who might want to construct their own adventures.

—DL

```
22040 NEXT I:
      IF NOT F1 THEN
        PRINT "NOTHING"
22050 PRINT "VISIBLE EXITS: ";
22060 FOR I=1 TO 4
22070   IF MID$(R$(L),I,1)<>"@" THEN
          PRINT DIR$(I);"  ";: F1=1
22080 NEXT I:
      IF NOT F1 THEN
        PRINT "DON'T EXIST"
22090 RETURN
24000 F1=0: PRINT "YOU ARE CARRYING":
      FOR I=1 TO NO
24010   IF OB(I)=0 THEN
          PRINT OB$(I): F1=1
24020 NEXT I:
      IF NOT F1 THEN
        PRINT "NOTHING"
24030 RETURN
25000 F1=0: F2=0:
      FOR I=1 TO NO
25005   IF N$=OB$(I) AND OB(I)=0 THEN
          PRINT "YOU ALREADY HAVE THE ";N$: RETURN
25010   IF (N$=OB$(I) OR N$="ALL" OR N$="EVERYTHING") AND (OB(I)=(L)) THEN
          OB(I)=0: PRINT OB$(I);" TAKEN": F1=1
25020   IF N$=OB$(I) THEN
          F2=1
25025 NEXT I
25030 IF F1=0 AND F2=0 AND N$<>"ALL" AND N$<>"EVERYTHING" THEN
        PRINT "I CAN'T TAKE THE ";N$: RETURN
25035 IF F1=0 AND F2=0 THEN
        PRINT "THERE IS NOTHING HERE I CAN TAKE."
25040 IF F1=0 AND F2=1 THEN
        PRINT "I DON'T SEE IT HERE."
25060 RETURN
26000 F1=0:
      FOR I=1 TO NO
26010   IF (OB$(I)=N$ OR N$="ALL" OR N$="EVERYTHING") AND (OB(I)=(0)) THEN
          OB(I)=L: F1=1
26020 NEXT I
26030 IF NOT F1 THEN
        PRINT "YOU CAN'T DROP WHAT YOU AREN'T CARRYING": RETURN
26040 PRINT "OK": RETURN
27000 F1=0:
      FOR I=1 TO NO
27010   IF (OB(I)=0 OR OB(I)=L) AND (OB$(I)=N$) THEN
          F1=1: PRINT OD$(I):
          IF OD$(I)="" THEN
            PRINT "I SEE NOTHING IMPORTANT.": RETURN
27020   IF (FL(I)=(L) OR FL(I)=0) AND (FR$(I)=N$) THEN
          F1=1: PRINT FD$(I):
          IF FD$(I)="" THEN
            PRINT "NOTHING EXTRAORDINARY HERE": RETURN
27030   IF F1 THEN
          RETURN
27040 NEXT I
27050 PRINT "I CAN'T DESCRIBE WHAT ISN'T HERE"
27060 RETURN
30000 DIM OB(26),OB$(26),RM$(26),RD$(26),R$(26),OD$(26),FR$(26),FL(26),FD$(26)
30001 RM$(1)="A DIMLY LIT HALL": RM$(2)="A DARK HALL": RM$(3)=
      "A VERY DARK HALL": RM$(4)="MONTY HALL": RM$(5)=
      "THE DARKEST HALL OF ALL": RM$(6)="A PITCH BLACK HALL"
30002 RM$(7)="THE CELLAR": RM$(8)="THE ATTIC": RM$(9)="THE BEDROOM": RM$(10)=
      "THE LIVING ROOM": RM$(11)="THE CELLAR STAIRS": RM$(12)="A TUNNEL":
      RM$(13)="THE PARLOR"
30003 RM$(14)="A BATHROOM": RM$(15)="THE WINE CELLAR": RM$(16)=
      "THE BILLIARDS ROOM": RM$(17)="A THRONE ROOM": RM$(18)="A HALLWAY"
30004 RM$(19)="A BALCONY": RM$(20)="THE PORCH": RM$(21)="THE LIBRARY": RM$(22)=
      "THE BLUE ROOM": RM$(23)="THE GREEN ROOM": RM$(24)="THE PINK ROOM":
      RM$(25)="THE YELLOW ROOM": RM$(26)="THE ROSE ROOM"
30010 R$(1)="BCGF": R$(2)="@EA@": R$(3)="EDHA": R$(4)="@@IC": R$(5)="P@CB":
      R$(6)="@A@@": R$(7)="AH@@": R$(8)="CI@G": R$(9)="D@JH"
30011 R$(10)="I@K@": R$(11)="J@LN": R$(12)="K@@@": R$(13)="ON@@": R$(14)=
      "@K@M": R$(15)="G@M@": R$(16)="Q@E@": R$(17)="R@P@"
30012 R$(18)="@SQ@": R$(19)="@T@R": R$(20)="@@US": R$(21)="T@V@": R$(22)=
      "UW@@": R$(23)="@XYV": R$(24)="@@ZW": R$(25)="WZ@@": R$(26)="X@@Y"
30020 L=1: NO=26
30030 OB$(1)="BATTERIES": OB$(2)="KNIFE": OB$(3)="DETONATOR": OB$(4)="WATCH":
      OB$(5)="WALLET": OB$(6)="COINS"
30031 OB$(7)="HAT": OB$(8)="BALL": OB$(9)="CAR": OB$(10)="GLASS": OB$(11)=
      "RUG": OB$(12)="CARPET": OB$(13)="LETTER": OB$(14)="KNIFE": OB$(15)=
      "GUN"
30032 OB$(16)="AXE": OB$(17)="DAGGER": OB$(18)="PAINT": OB$(19)="HAMMER":
      OB$(20)="SAW": OB$(21)="BOX": OB$(22)="RAZOR": OB$(23)="PIN": OB$(23)=
      "CARTON": OB$(24)="PLUG": OB$(25)="MALLET": OB$(26)="CHAIN"
30040 FOR I=1 TO NO:
        OB(I)=I:
      NEXT I
30050 DIR$(1)="NORTH": DIR$(3)="SOUTH": DIR$(2)="EAST": DIR$(4)="WEST"
30060 RD$(1)="A SMALL WATERFALL TRICKLES TO THE FLOOR, WETTING EVERYTHING":
      RD$(2)="THERE IS AN ODOR OF DEATH HERE"
30100 OD$(1)="PLAIN DURACELLS": OD$(2)="IT IS RUSTY": OD$(3)=
      "IT APPEARS TO BE HOME MADE": OD$(5)="IT IS EMPTY"
30200 FR$(1)="WATERFALL": FD$(1)="IT IS COLD AND WET": FL(1)=1: FR$(2)="WALL":
      FD$(2)="JUST AN ORDINARY WALL": FL(2)=0
30201 FR$(3)="FLOOR": FL=0
32000 RETURN
```

FILL IN THE NEXT PRESIDENT OF THE UNITED STATES!


SEAL OF THE PRESIDENT OF THE UNITED STATES
E PLURIBUS UNUM

Ever been disenchanted with the way past elections have gone? Disappointed with the campaign strategies of your favorite candidates? Wondered how candidates from different presidential contests, such as JFK and Ronald Reagan, would have fared against each other? How would you do if **you** *ran for President?*

Well, now you can do something about all these frustrations and fantasies — with PRESIDENT ELECT™ from SSI.

It perfectly simulates the presidential campaign process to let **you** manage the grueling nine-week race for the candidate of your choice. You can use *preprogrammed historical candidates or make up your own. The computer reflects the political climate from 1960* to 1984 based on the prevailing economic indicators and U.S. and foreign news.

On the campaign trail, you must allocate your money among key-state, *regional, and national advertising.* Campaign stops must be carefully planned to avoid fatigue. You must decide on the pros and cons of debate as well as grapple with national and international crises.

If you've run a smart race, you'll be rewarded by weekly polls that show favorable shifts in the popular vote and a Hi-Res color map of the U.S. that reflects an increase in your electoral votes.

When election night rolls around, you can resolve it instantly or experience it with an intense, minute-by-minute account.

And who knows? Under your expert management, we may have Richard Nixon to kick around once again. Or you may have won for Hubert Horatio Humphrey what he could not achieve in his many trials. Even better yet, you may have won for yourself the Presidency of the United States!

PRESIDENT ELECT is a three-player *game representing the Republican, Democratic, and possible third-party candidates. The computer can play any or all three positions.*

As long as you're thinking about running, you might as well run down to your local store and get this great game today.

VISA and MC card holders can charge your order by calling **800-227-1617, ext. 335 toll free.** California residents call 800-772-3545, ext. 335.

To order by mail, send your check to Strategic Simulations Inc.
465 Fairchild Drive, Suite 108
Mountain View, CA 94043.

For $39.95, PRESIDENT ELECT comes on 48K disk for Apple II with Applesoft ROM card. We offer a 14-day money-back guarantee.

STRATEGIC SIMULATIONS INC.

part of our demanding standards of excellence, we use maxell floppy discs.

Apple is a registered trademark of Apple Computer, Inc.

CIRCLE 245 ON READER SERVICE CARD

David H. Ahl

The Rollercoaster Game Dissected

"Over my dead body you will!" This was the response I got from David Lubar when I suggested running a map of the *Rollercoaster* game with the information as to what is found in each spot.

His reasoning was that the game could be played by someone whether they had a videodisc player or not. The only difference is that a person with a videodisc player and interface would be able to see the motion sequences where other players would merely have them described by the computer program.

My reasoning was that this is the first computer/videodisc game ever published and that if it is going to be part of the entertainment wave of the future, we ought to share as much information about it as possible.

My reasoning prevailed and, thus, you are reading this article. Mr. Lubar was last heard saying, "Mutter, mutter. You're the publisher."

Flash Back

Ever since I saw an experimental videodisc player from Phillips/MCA in 1975 and published three articles about videodiscs in March of 1976, I have been enthusiastic about the medium. More recently, I have gotten very excited about the possibilities for computer programs which take advantage of the videodisc. Many educators and people involved in industrial training are working in similar directions. However, my thoughts were more in the area of home entertainment.

In particular, I imagined an adventure-type game based on the movie *Jaws*. I haven't quite worked out the entire scenario, however, I envision a scene where a shark is about to attack and is swimming toward you with his jaws wide open when the screen goes blank and you are asked for a decision. Make the right decision, and the shark would back off, probably in reverse slow motion and you would see it recede into the ocean. Make the wrong decision and, of course, you get eaten and lose the game. Or, you might invoke magic which would transform you to an entirely different time and place. If you did this, you might or might not lose some of the objects you have gained and you might be posed with an entirely different set of problems based on your new location.

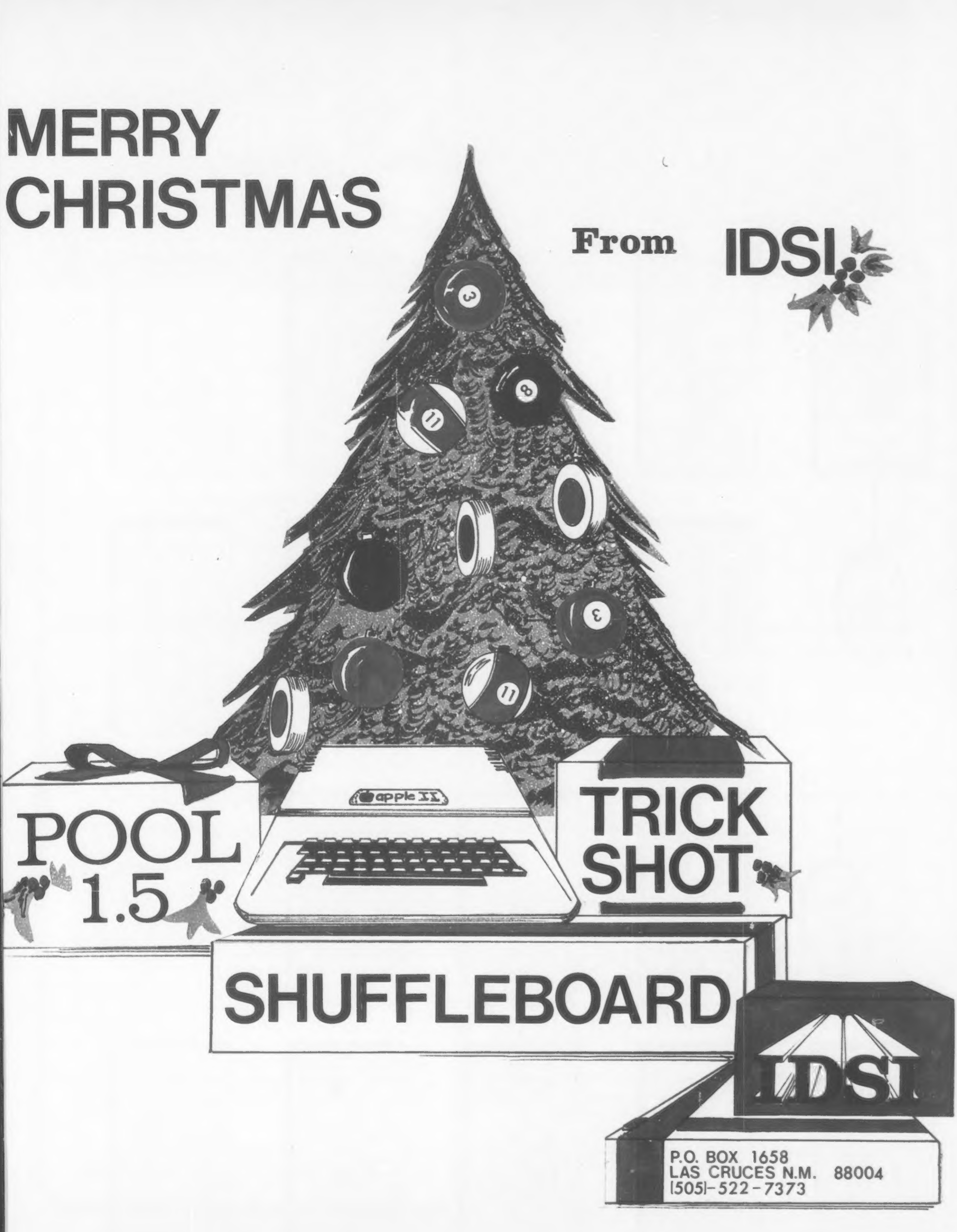
I envisioned using portions of the soundtrack with only the computer output visible on the screen. I also saw opportunities for the player to put in his own search coordinates (a frame number) not knowing, of course, what was there beforehand. Based on what he finds in a particular location, he must continue the game from that point. Thus, I envisioned a very open-ended type of game as opposed to the completely structured adventures and other games that exist today.

Can it all be done? I think so. We are, of course, starting in a much more structured way. However, I believe that this game will give you some idea of what the capabilities are of marrying the computer with the videodisc.

How the Game Works

After showing the appropriate title graphics, the player is told that a madman has planted a bomb on a rollercoaster. At this point a 10-second scene of the bomb being planted is shown. A message flashes back that you, the player, are being sent to stop the saboteur. At this point a 10-second sequence of a plane landing is shown followed by some additional introductory messages.

After this, you find yourself in a central area of the midway. (See diagram.) Some of the video sequences (both still frames



MERRY CHRISTMAS

From IDSI

POOL 1.5

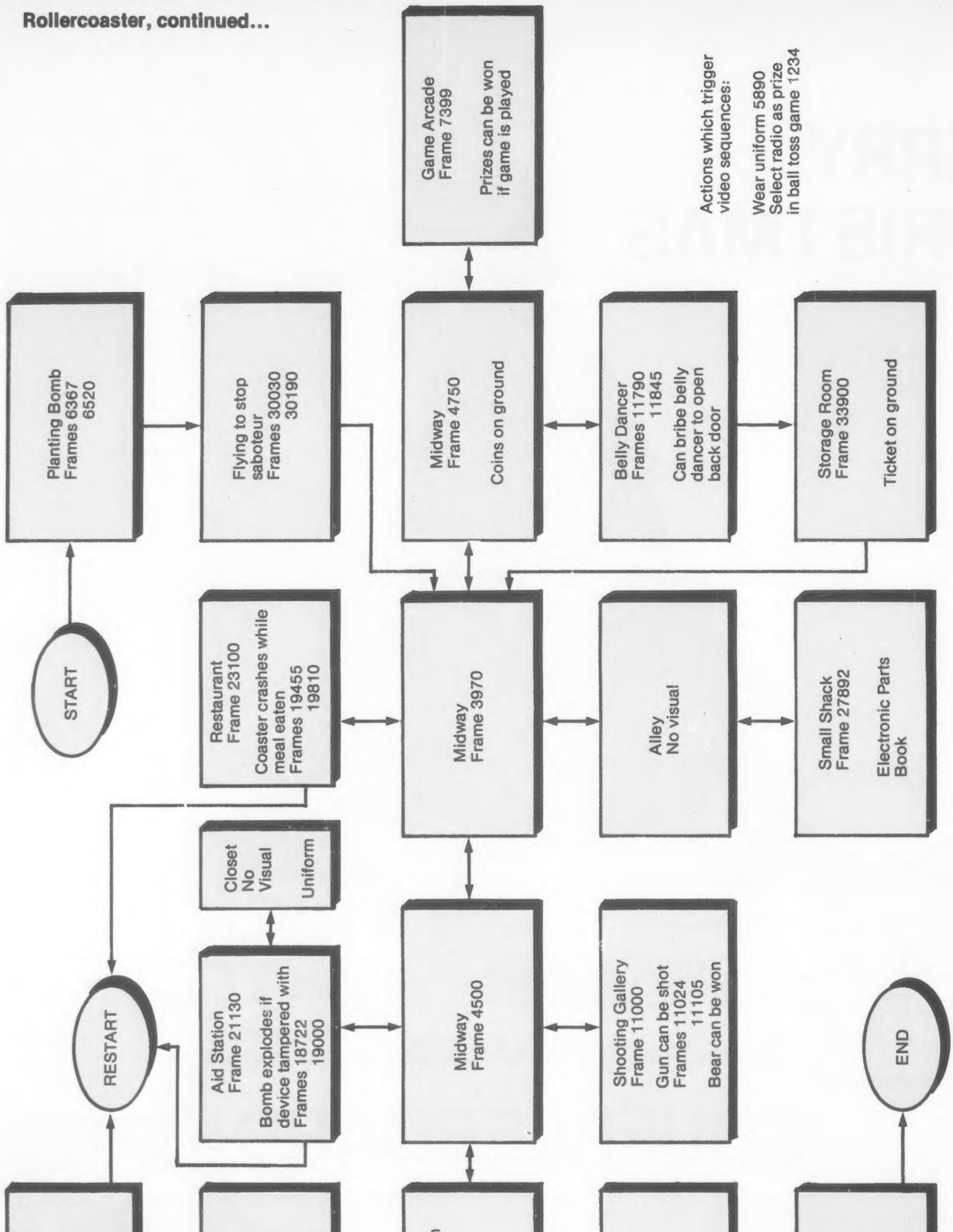
TRICK SHOT

SHUFFLEBOARD

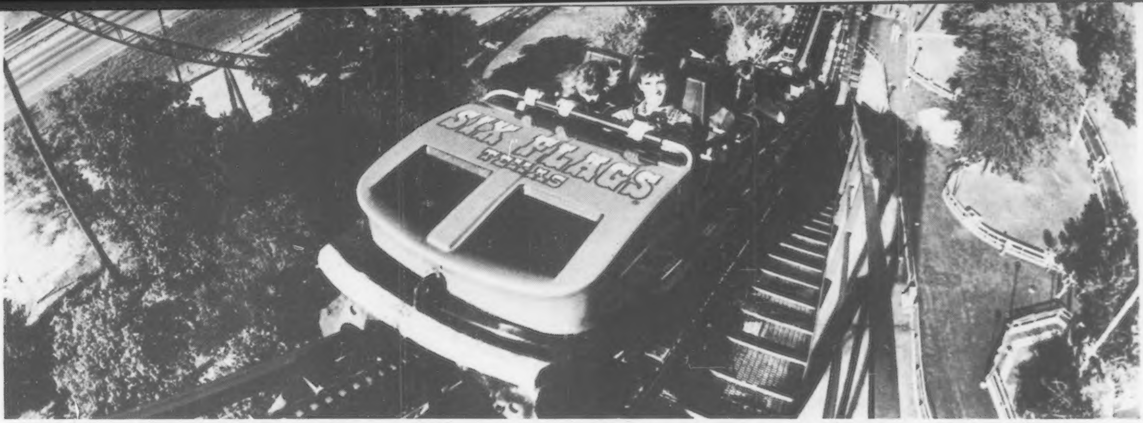
IDSI

P.O. BOX 1658
LAS CRUCES N.M. 88004
(505)-522-7373

CIRCLE 147 ON READER SERVICE CARD


START
Planting Bomb
Frames 6367
6520
RESTART
Top of Coaster
Frame 15360
Coaster comes
Frames 16000
16200
Crawlway
Frames 14718
14782
Aid Station
Frame 21130
Bomb explodes if
device tampered with
Frames 18722
19000
Closet
No
Visual
Uniform
Restaurant
Frame 23100
Coaster crashes while
meal eaten
Frames 19455
19810
Flying to stop
saboteur
Frames 30030
30190
Maintenance Room
Frames 14038
14100
Toolkit
Midway
Frame 4500
Midway
Frame 3970
Midway
Frame 4750
Coins on ground
Game Arcade
Frame 7399
Prizes can be won
if game is played
Tunnel
No visual
Shooting Gallery
Frame 11000
Gun can be shot
Frames 11024
11105
Bear can be won
Alley
No visual
Belly Dancer
Frames 11790
11845
Can bribe belly
dancer to open
back door
Observation Tower
Frames 8300
8500
Can use jammer
Frames 12190
12450
END
Small Shack
Frame 27892
Electronic Parts
Book
Storage Room
Frame 33900
Ticket on ground
Actions which trigger
video sequences:
Wear uniform 5890
Select radio as prize
in ball toss game 1234

Location Map of Rollercoaster Videodisc/Computer Game



and motion sequences) are activated by going to a new place in the game-playing area. Other video sequences are activated by picking up an object or giving some other command. For example, the command "Wear Uniform" triggers a still frame of the groundskeeper in a uniform.

Still other video sequences are triggered as part of a sequence of events over which a player has no control. For example, if you crawl too far out on the coaster track, you are shown a scene of the empty track followed by a computer message that says "The sound of the coaster is getting very loud." This is immediately followed by a scene of the coaster passing by after knocking you unconcious. This triggers one of the alternate end-of-game routines and you are given the opportunity to play again.

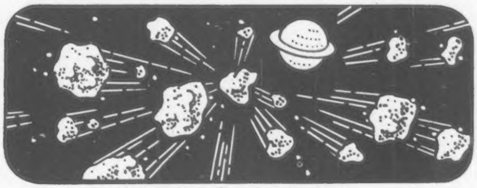
Possible Extensions

The mind boggles with the possible extensions to a videodisc/computer game. For example, the way the game is written now, the bomb explodes if the player tampers with the electronic device in the Aid Station. A possible alternative: by turning the knob on the device you discover that it is an alien time warp machine and that it reverses time for ten seconds. You might see the rollercoaster going backwards or people walking backwards on the midway for the next ten seconds. Used in the adventure, you might have to find a detonator, take it to the Aid Station and explode the bomb, make time go backwards and un-explode the bomb in order to find out on what frequency the detonator works so that you are able to construct a jammer.

Of course, there are many, many possible extensions. One side of the videodisc has over 50,000 individual frames on it and the disc of *Rollercoaster* which we are using for this adventure has over 120 separate motion sequences on the first side. Thus, it should be apparent that we are just scratching the surface with the game as it currently exists. ☐

AMBER SOFTWARE

Software for Apple and Apple II plus



Galaxy Rocks™ by Jay Crafferty

With Galaxy Rocks you explore space while trying to avoid the menancing 3-D asteroids that are capable of destroying your ship on contact. Paddles control your position in space and your phaser cannon. A fast machine language approach to this classic space game. Runs on any Apple with Applesoft and at least 48K of RAM. Diskette $34.95.

AMBER SOFTWARE
Amber Software
170 Parsippany Rd., Parsippany NJ
(201) 887-6474

CIRCLE 101 ON READER SERVICE CARD

The search for quality hardcopy stops

HERE

microCOMPOSER

THE ULTIMATE IN HARD COPY!

You can use the TRS-80® I or III to set publication grade photo type. Not "letter quality" impact type, but true publication level photo TYPE—with all the variety of style, size and format that is only possible with genuine typesetting. (Like this ad, for example.)

The microCOMPOSER system makes it possible for a TRS-80 I or III to drive a Compuwriter I or II (Juniors also) or a Compuwriter IV with complete control and access of the Compuwriter's capabilities. Enjoy all the power of a computerized word processor for keyboarding and store files on floppy disks.

The Compuwriter is not modified in any way. microCOMPOSER's interface is independently packaged and uses an already existing plug connector in the Compuwriter. Four simple wires to solder (five in some cases) and a switch to mount in an existing hole. That's all! The computer and the Compuwriter may be used independently at any time.

The microCOMPOSER revolution has begun.
We have a free brochure with details:

CYBERTEXT CORPORATION • Box 860 • Arcata, CA 95521 • 707-822-7079

Dealer inquiries invited.

CIRCLE 143 ON READER SERVICE CARD

Vision of the Future

Tim Onosko

The scene is your living room. You're watching a television program—let's say it's a cop show. A policeman is questioning a man suspected of committing a crime. The suspect answers in a barely audible tone, and his words come slowly. The policeman finishes his interrogation, then turns to the camera and asks *you* a question: Should *we* believe him?

On a hand-held remote control, you press a button indicating that you doubt the suspect's story. The cop consults you again, this time offering three possibilities.

Do you think the suspect was:

a) lying?

b) concealing important facts?

c) in shock and unable to communicate accurately?

What's going on here? It's just one of the scenarios that has been proposed for the new medium of interactive videodiscs.

An interactive videodisc is one which allows the viewer to determine the order in which it is watched, or is otherwise organized so that it isn't necessarily viewed in a linear, beginning-to-end way. Interactive videodiscs can be powerful teaching tools, new dramatic experiences, or exotic toys.

The idea of a television program you can *use* rather than only *watch* isn't new. Two-way cable television offers audiences the opportunity to respond to what they're watching, but these systems usually poll an audience, so a viewer who responds to the show becomes part of a *group* decision. No *personal* decisions can be made in an interactive cable system, since everyone watching the program must see the same one.

Other interactive television programs have been (and continue to be) designed and produced for videotape; reels of tape are shuttled back and forth, from segment to segment, to locate the information the viewer wants or needs. But videotape is a linear, "ribbon" medium, and the process of locating an appropriate program segment can take minutes.

All videodiscs are not alike.

Videodisc, because it is a "radial" medium which can be scanned quickly to locate any segment, is the ideal choice for interactive video programs and projects.

First, though, it is important to understand that all videodiscs are not alike. Presently, three, incompatible videodisc systems have been developed and are either in use, or soon will be.

Three Formats

The first videodisc system to be introduced was the *laser-optical* disc system, developed jointly by Philips of the Netherlands, the giant electronics company, and by MCA, the American entertainment conglomerate. Aimed squarely at both the industrial/institutional and consumer markets, the laser-optical disc has been supported by the entries of IBM, Pioneer and Sony of Japan. Since its introduction, the laser-optical video disc system has acquired the generic name of *LaserVision*.

In the spring of 1981, the *capacitance* videodisc, nicknamed *CED* (for *C*apacitance *E*lectronic *D*isc) joined the laser-optical disc in the consumer marketplace. The CED disc is a product of RCA research. Zenith, the American electronics manufacturer, and several Japanese companies, including Hitachi and Toshiba, have fallen in line behind the CED system.

A third videodisc system is called *VHD*, for *V*ideo *H*igh *D*ensity, and is scheduled to appear in the U.S. either late this year, or during 1982. VHD was developed by Matsushita of Japan. Matsushita has had great success popularizing home videocassette recorders (VHS format) worldwide, and is hoping to duplicate this success with videodiscs.

All three videodisc formats perform one basic task identically. All play back prerecorded video programming with good picture reproduction and crisp sound. Beyond that, however, there are major differences among the systems.

The grooveless LaserVision discs, as their name indicates, are read by focusing

---

Tim Onosko, 1338 Rutledge St., Madison, WI 53703.

Easy, Fun, Informative. . .

Four New Books From OSBORNE/McGraw-Hill

WordStar™ Made Easy

This book teaches you to use WordStar in 14 easy, time-saving lessons. It will have you using WordStar comfortably on your very first day. And it will help you move quickly forward to advanced applications, one simple step at a time. The book comes with a convenient, pull-out command card — a quick reference to all of WordStar's most frequently used commands.

By Walter Ettlin
Book #69-1 $7.95

An Introduction to Microcomputers Volume 0: The Beginner's Book, Third Edition

This new edition of our very popular beginner's book has been completely revised and expanded. In a lighthearted style, the book explains the basics of the microcomputer: What is a microcomputer? What can it do? How does it function? How do I use it? Why are there differences between computers? This is a book for everyone who is planning to purchase a personal computer, and for everyone who needs to know more about them.

By Adam Osborne and David Bunnell
Book #64-0 $7.95

PET™ Fun and Games

Ready. . . Set. . . Load! A carnival for your computer. Climb mountains, dodge sharks, roll the dice, and twist your brain. This book presents 30 great games for your PET or CBM computer as selected from CURSOR magazine. You can key them directly into your computer and you're ready to play. Nothing could be simpler or more fun.

By Ron Jeffries and Glen Fisher
Book #70-5 $10.00

Your ATARI® Computer: A Guide to ATARI® 400/800™ Computers

This book collects in one place all of the information that will make it easy for you to take full advantage of your ATARI computer's special features. Chapters cover getting started, BASIC programming, the cassette recorder, the printer, and the disks. The unique sound and graphics capabilities of the ATARI are covered in depth in three separate chapters. The book is written in an easy-to-follow, informative style that will be appreciated by novices and advanced computer users alike.

By Lon Poole, Martin McNiff, and Steven Cook
Book #65-9 $15.00

CIRCLE 315 ON READER SERVICE CARD

OSBORNE/McGraw-Hill
630 Bancroft Way, Berkeley, CA 94710 Dept. L15

Telephone: (415) 548-2805
Toll Free Outside California: 800-227-2895

Name: __________
Address: __________
City: __________ State: _____ ZIP: _____

Make check/money order payable to OSBORNE/McGraw-Hill
OR charge my ☐ VISA ☐ MasterCard

Card No: __________
Expiration Date: __________
Signature: __________

Book No.	Title	Price

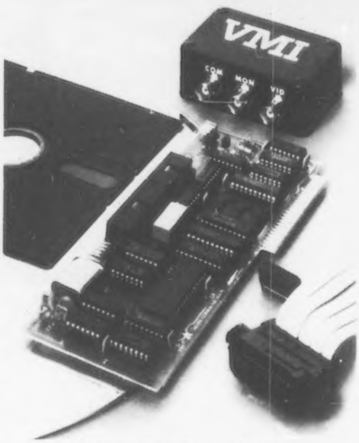
Shipping: ☐ $0.75/item 4th class
☐ $1.50/item UPS
☐ $2.50/item Air Mail
☐ $10.00/item Overseas

Shipping: _____
Tax: _____
Total: _____

(California residents add applicable sales tax)

1155

The OmniScan interface from Aurora Systems.



Video-Microcomputer Interface by Allen Communication.

a tiny, flea-powered laser beam into the core of a reflective disc, where information is stored in the form of microscopic "pits" arranged in a spiral. (The length of each pit, as well as the distance between one pit and the next, actually conveys the information.) Since nothing physically comes in contact with the disc, LaserVision discs can be played, sped-up, slowed-down, scanned rapidly, played backwards, or held on any particular still frame, practically indefinitely, without wear.

One side of a LaserVision disc can store one half hour of video programming, or up to 54,000 individual frames of visual material. (Each rotation of the disc, which spins at 1800 RPM, is the equivalent of one television frame.) Another method of coding information, an "extended play" mode yields one hour of video programming per side, but many of the features of the system, including still frame and slow motion, are sacrificed by this information-packing arrangement.

Like a LaserVision extended play disc, the CED disc system is limited in its capabilities, chiefly because CED discs are grooved, like conventional phonograph records. When a CED disc is played, a stylus (actually a microelectronic sensor) tracks the disc, and detects minor changes in the electrical value of capacitance, caused by tiny "hash marks" at the bottom of the groove.

When developing the CED disc system, RCA aimed to make it as inexpensive as possible. The grooves in the discs eliminated the need for a sophisticated tracking system, but also made CED less capable, by design. Because of the grooves, and because each rotation of a CED disc is equal to four television frames, CED cannot produce a still picture. (Theoretically, this can be done, but it would probably require circuitry to digitize a television picture, and enough solid-state memory to hold and display it.)

This makes CED cheap. Players retail at about $500, as compared to the $750 investment required by LaserVision players.

There have been two generations of consumer players.

The VHD disc system combines some of the best elements of each system. They are grooveless, and a sensor floating just above the disk surface again measures variances in capacitance. But, while the VHD system is basically as capable as LaserVision, it was designed to compete with the economy of CED, and players will have few more functions than a CED player, without the addition of a VHD "trick box," to be sold at an additional cost.

Comparison of Formats

While no real videodisc "standard" has emerged, it seems apparent that, *using capability as a basis for judgment*, the LaserVision system is best suited to meet growing information needs in the coming years. When its capabilities are considered and "built into" programs, LaserVision shows distinct advantages, and especially lends itself to interactive applications.

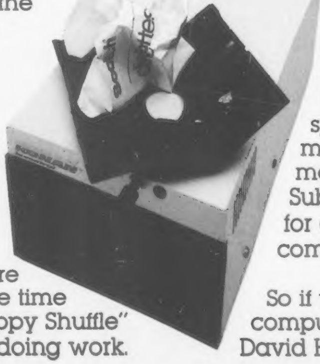
For example:

- LaserVision players can be computer-controlled. Visual material can be intermixed with computer-generated characters and graphics, and can operate under software control.
- Because the LaserVision system incorporates two separate audio channels, these can be used for either stereo sound, bilingual commentary, or alternative information which can be switched from track to track, under either manual or software control.
- Still frame capability gives LaserVision the ability to use large numbers of single frames as a kind of visual database. One side of an optical disc can store 54,000 single *character-generated frames*, the rough equivalent of 3000 to 4000 typeset magazine pages such as the one you're reading now. Photographs and diagrams, of course, can be intermixed with text. (Consider that 10,000 single frames—a staggering amount of visual information—can be included on a disc, leaving 24 minutes for real time video.)
- LaserVision discs can be subdivided into "chapters," which are arbitrary divisions of program material. Using chapter divisions, it's possible to organize information by category, or mix diverse program segments on the same disc. Short films or various activity segments can be "menu" selected by the viewer.
- While the most obvious application of slow motion viewing is to analyze motion, this feature can also be used to compress action, so as to save valuable information space on a disc. Teaching almost any procedure can be reduced to a series of a few dozen still frames that can be "walked through" (with the disc player in slow motion), yielding relatively fluid action, but consuming just a few seconds, rather than minutes, of real time video.
- Most LaserVision disc players can randomly access any frame or chapter.

Stop the Floppy Shuffle

PAYROLL I
initialized
1-18-81

Announcing
The David Hard Disk Subsystem



Compared to cassettes, floppies were the greatest thing since the integrated chip. But with increased applications, data bases, and speed requirements, a lot of business people are spending more time doing the "Floppy Shuffle" and less time doing work.

Now with Konan's David Hard Disk Subsystem you can have 32 times the storage of a mini-floppy in about the same amount of space. At a cost per megabyte that really makes sense, the David Subsystem is available for a variety of microcomputers.

So if you own a personal computer, check into the David Hard Disk Subsystem at your local dealer and stop doing the Floppy Shuffle. And if you want real timesharing capabilities, a networking card is available.

The David Subsystem is available immediately.

Toll-free Information Line

800-528-4563

KONAN™

KONAN CORPORATION
1448 NORTH 27TH AVE, PHOENIX, AZ 85009
(602) 269-2649, TWX/TELEX 9109511552

CIRCLE 294 ON READER SERVICE CARD

Our incredible low prices just got 2% lower.

Have a merry computer and a happy software.

Take an additional 2% off our listed prices, until December 24.

16 K RAM KITS 13.95

Set of 8 NEC 4116 200 ns
GUARANTEED ONE FULL YEAR.

DISKETTES

ALPHA DISKS® 21.95

SINGLE SIDED, CERT.DOUBLE DENSITY 40 TRACKS, WITH HUB-RING, BOX OF 10, GUARANTEED ONE FULL YEAR.

VERBATIM DATALIFE

MD 525-01, 10, 16	26.50
MD 550-01, 10, 16	44.50
MD 577-01, 10, 16	34.80
MD 577-01, 10, 16	45.60
FD 32 OR 34-9000	36.00
FD 32 OR 34-8000	45.60
FD 34-4001	48.60

DISKETTE STORAGE

5¼'' PLASTIC LIBRARY CASE	2.50
8'' PLASTIC LIBRARY CASE	3.50
PLASTIC STORAGE BINDER W/Inserts	9.95
PROTECTOR 5¼''	21.95
PROTECTOR 8''	24.95

INTEGRATED COMPUTER SYSTEMS

NORTHSTAR	CALL
ALTOS	CALL
ZENITH Z89	CALL
CALIF. COMPUTER SYSTEMS	CALL
MORROW DESIGNS	CALL

PRINTERS

ANADEX DP 9500	1295.00
ANADEX DP 9501	1295.00
CENTRONICS 739	765.00
C-ITOH 25 CPS PARALLEL	1440.00
C-ITOH 25 CPS SERIAL	1495.00
C-ITOH 45 CPS PARALLEL	1770.00
C-ITOH 40 CPS SERIAL	1870.00
C-ITOH TRACTOR OPTION	195.00
EPSON MX-80	$CALL
EPSON MX-80 F/T	$CALL
EPSON MX-100 GRAPHIC	$CALL
EPSON GRAPHICS ROM	90.00
IDS-445G PAPER TIGER	779.00
IDS-460G PAPER TIGER	945.00
IDS-560G PAPER TIGER	1195.00
NEC SPINWRITER 3510 Ser.RO	2195.00
NEC SPINWRITER 3530 Par.RO	2195.00
NEC SPINWRITER 7710 Ser.RO	2645.00
NEC SPINWRITER 7730 Par.RO	2645.00
NEC SPINWRITER 7700 D Sellum	2795.00
NEC SPINWRITER 3500 Sellum	2295.00
OKIDATA MICROLINE 80	389.00
OKIDATA MICROLINE 82A	549.00
OKIDATA MICROLINE 83A	849.00
OKIDATA MICROLINE 84	1199.00
QUME 9/45	2149.00
MALIBU 200 DUAL MODE	2695.00

CORVUS

FOR S-100, APPLE OR TRS-80 MOD I,II

Controller, Case/P.S, Operating System, A & T.

5 Megabytes	3245.00
10 Megabytes	4645.00
20 Megabytes	5545.00
MIRROR BACK-UP	725.00

APPLE SOFTWARE

MAGIC WINDOW Word Processor	89.00
MAGIC WAND	275.00
WORDSTAR	259.00
MAILMERGE(Req.WORDSTAR)	90.00
SPELLSTAR(Req.WORDSTAR)	169.00
DATASTAR	199.00
EXPEDITER II Applesoft Compiler	89.00
PFS: PERSONAL FILING SYSTEM	79.00
PFS: REPORT GENERATOR	79.00
ASCII EXPRESS Terminal Program	59.95
Z-TERM CP/M® Comm.Software	89.95
MICROSOFT FORTRAN	165.00
MICROSOFT COBOL	550.00
DB MASTER 3.0	179.00
VISICALC 3.3	169.00
VISIPLOT	149.00
VISIDEX	169.00
CCA DATA BASE MANAGER	99.00
A-STAT COMP. STATISTICS PKG.	119.00

APPLE HARDWARE

VERSA WRITER DIGITIZER	249.00
ABT APPLE KEYPAD	119.00
MICROSOFT Z-80 SOFTCARD	299.00
MICROSOFT RAMCARD	170.00
VIDEX 80 × 24 VIDEO CARD	299.00
VIDEX KEYBOARD ENHANCER	99.00
M&R SUPERTERM 80 × 24 Video Bd.	315.00
NEC 12'' GREEN MONITOR	199.00
SANYO 12'' MONITOR(B&W)	249.00
SANYO 12'' MONITOR(Green)	269.00
SANYO 13'' COLOR MONITOR	469.00
SSM AIO BOARD (INTERFACE)A&T	165.00
SSM AIO BOARD (INTERFACE)KIT	135.00
ZENITH 13'' HI-RES.Green MON.	139.00

MOUNTAIN HARDWARE

CPS MULTIFUNCTION BOARD	209.00
SUPERTALKER SD200	259.00
ROMPLUS W/KEYBOARD FILTER	179.00
ROMPLUS W/O KEYBOARD FILTER	130.00
KEYBOARD FILTER ROM	49.00
COPYROM	49.00
MUSIC SYSTEM	459.00
ROMWRITER	149.00
APPLE CLOCK	252.00
A/D + D/A	299.00
EXPANSION CHASSIS	625.00

CALIF. COMPUTER SYSTEMS

S-100 BOARDS

2200A MAINFRAME	359.00
2032A 32K STATIC RAM	599.00
2065C 64K DYNAMIC RAM	499.00
2422 FLOPPY DISK CONT.& CP/M®	339.00
2710 FOUR SERIAL I/O	249.00
2718 2 SERIAL/2 PARALLEL I/O	269.00
2720 FOUR PARALLEL I/O	199.00
2810 Z-80 CPU	249.00

APPLE BOARDS

7710A Asynchronous Ser. Interface	139.00
7712A Synchronous Ser. Interface	149.00
7424A CALENDER CLOCK	99.00
7728A CENTRONICS Printer Interface	99.00

APPLE GAME SOFTWARE

COMPUTER QUARTERBACK	32.95
THE WARP FACTOR	32.95
CARTELS AND CUTTHROATS	32.95
TORPEDO FIRE	49.95
THE SHATTERED ALLIANCE	49.95
COMPUTER BASEBALL	32.95
POOL 1.5	29.95
ULTIMA	33.95
RASTER BLASTER	24.95
FLIGHT SIMULATOR	27.95
INTERNATIONAL GRAND PRIX	25.95
COSMO MISSION	24.95
SARGON II	28.95
SHUFFLE BOARD	29.95
TAWALA'S LAST REDOUBT	24.95
GALAXY WARS	20.95
ALIEN RAIN (AKA GALAXIAN)	20.95
SNOGGLE (REQ. JOYSTICK)	27.95
ALIEN TYPHOON	20.95
APPLE PANIC	24.95
SPACE WARRIOR	20.95
PHANTOMS FIVE	24.95

VISTA COMPUTER CO.

APPLE 40 Tk.Drive A40 (163K Bytes)	389.00
APPLE 80 Tk.Drive A80 (326K Bytes)	549.00
APPLE 160Tk.Dr.A160(652K Bytes)	799.00
APPLE 80 COLUMN CARD	329.00
APPLE 8 Inch Disk Drive Controller	549.00

CP/M SOFTWARE

MICROSOFT BASIC-80	299.00
MICROSOFT BASIC COMPILER	319.00
MICROSOFT FORTRAN-80	369.00
PEACHTREE SYSTEMS	CALL
MAGIC WAND(Requires CP/M®)	275.00
WORDSTAR(Requires CP/M®)	325.00
MAILMERGE(Requires WORDSTAR)	110.00
SPELLSTAR(Requires WORDSTAR)	199.00
CALCSTAR	239.00
DATASTAR	249.00
SPELLGUARD	239.00

CP/M is a registered trademark of Digital Research.

MODEMS

NOVATION CAT ACOUSTIC MODEM	145.00
NOVATION D-CAT Direct Connect	155.00
NOVATION AUTO-CAT AUTO ANS.	219.00
NOVATION APPLE-CAT	349.00
UDS 103 LP DIRECT CONNECT	175.00
UDS 103 JLP AUTO ANSWER	209.00
D.C.HAYES MICROMODEM II(Apple)	299.00
D.C.HAYES 100 MODEM(S-100)	325.00
D.C.HAYES Smart Modem(RS 232)	249.00
LEXICON LX-11 MODEM	109.00

SUPPLIES

AVERY TABULABLES

1,000 3½ × 15/16	8.49
3,000 3½ × 15/16	14.95
5,000 3½ × 15/16	19.95

PAPER (Prices F.O.B. S.P.)

9½ × 11 18lb. white 3000 ct.	29.00
14 7/8 × 11 18lb. white 3000 ct.	39.00

TRS-80 MOD I HARDWARE

PERCOM DATA SEPARATOR	27.00
PERCOM DOUBLER II	159.00
DOUBLE ZAP II/80	45.95
TANDON 80 TRACK DISK DRIVE	429.00
TANDON 40 TRACK DISK DRIVE	299.00
LNW DOUBLER W/ DOSPLUS 3.3D	159.00

TRS-80 SOFTWARE

NEWDOS/80 2.0 MOD I	139.00
LAZY WRITER MOD I	125.00
PROSOFT NEWSCRIPT MOD I,III	99.00
SPECIAL DELIVERY MOD I,III	119.00
X-TRA SPECIAL DELIVERY MOD I,III	199.00
TRACKCESS MOD I	24.95
OMNITERM SMART TERM. MOD I,III	89.95
MICROSOFT BASIC COMP.For Mod I	165.00

MORROW DESIGNS

FLOPPY DISK SYSTEMS

Controller, P.S., Microsoft Basic,
CP/M® , A&T

DISCUS 2D(Single Drive—500K)	869.00
DISCUS 2D(Dual-Drive—1 MEG)	1499.00
DISCUS 2 + 2(Single Drive—1MEG)	1099.00
DISCUS 2 + 2(Dual Drive—2 MEG)	1999.00

HARD DISK SYSTEMS

Controller, P.S., Microsoft Basic,
CP/M® , A&T

DISCUS M10 (10 Megabytes)	3099.00
DISCUS M26 (26 Megabytes)	3949.00

We stock a complete line of computer covers, printer ribbons, print wheels & NEC thimbles—CALL US FOR YOUR NEEDS.

We built a reputation on our prices and your satisfaction.

Alpha Byte STORES

We guarantee everything we sell for 30 days. If anything is wrong, just return the item and we'll make it right. And, of course, we'll pay the shipping charges.

We accept Visa and Master Card on all orders. COD orders accepted up to $300.00.

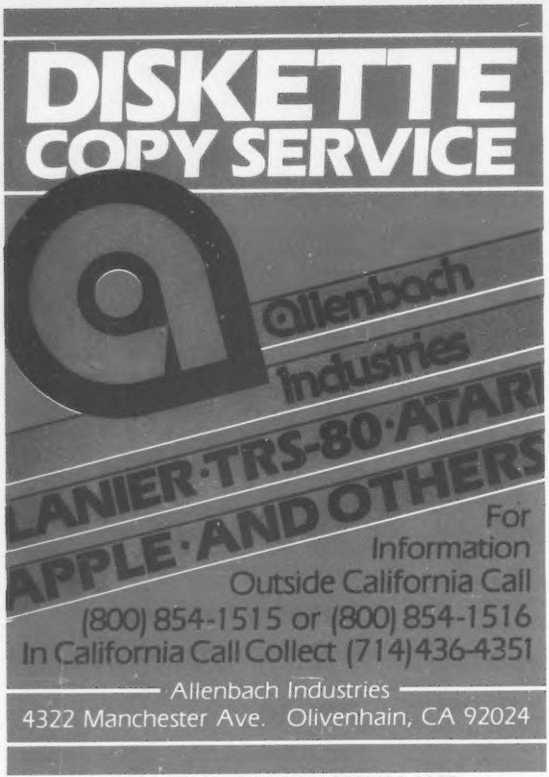
Please add $2.00 for standard UPS shipping and handling on orders under 50 pounds, delivered in the continental U.S. Call us for shipping charges on items that weigh more than 50 pounds. Foreign, FPO and APO orders please add 15% for shipping. California residents add 6% sales tax.

The prices quoted are only valid for stock on hand and all prices are subject to change without notice.

(213)706-0333

31245 LA BAYA DRIVE, WESTLAKE VILLAGE, CALIFORNIA 91362

CIRCLE 170 ON READER SERVICE CARD



DISKETTE COPY SERVICE

allenbach industries

LANIER·TRS-80·ATARI
APPLE·AND OTHERS

For
Information
Outside California Call
(800) 854-1515 or (800) 854-1516
In California Call Collect (714) 436-4351

Allenbach Industries
4322 Manchester Ave. Olivenhain, CA 92024

CIRCLE 112 ON READER SERVICE CARD

L I S P for the Apple II

Pegasys Systems' new P-LISP interpreter is a full implementation of the well-known Artificial Intelligence language. Written in machine code, this powerful interpreter includes the following features:

- Over 55 functions implemented
- Extensive 45-page User Manual
- Full function trace
- Floating point math and Hires graphics
- Function editor and pretty-printer
- Break mode for function debugging
- PROG construct, EXPRs, and FEXPRs
- ELIZA and other sample programs included

P-LISP is supplied on disk with User Manual for $99.95. The manual is available separately for $10.00. Please specify DOS 3.2 or 3.3.

PEGASYS SYSTEMS, INC.
4005 Chestnut Street
Philadelphia, PA 19104

PEGASYS

Orders only: 800-523-0725
PA residents and inquiries: (215) 387-1500

Pennsylvania residents add 6% sales tax
Apple is a trademark of Apple Computer, Inc.

VISA

Good software is no longer a myth.

CIRCLE 292 ON READER SERVICE CARD

THE
I.O.
by
bill
sefton
INSPECTOR

APPLE DISK & MEMORY UTILITY

- **Repairs Blown Disks**
- **Reads Nibbles**
- **Maps Disk Space**
- **Searches Disks**
- **Searches Memory**
- **Edits Disk Sectors**
- **Outputs Screen to Printer**
- **Displays Memory In HEX/ASCII**

THE INSPECTOR

These utilities enable the user to examine data both in the Apple's memory and on disks. Simple commands allow scanning through RAM and ROM memory as well as reading, displaying and changing data on disk.

Read and rewrite sections of Random Access files. Reconstruct a blown VTOC. Weed out unwanted control characters in CATALOG listings. UnDELETE deleted files or programs. Repair files that have erroneous data. All without being under program control, and more.....

You may transfer sectors between disks. This allows you to transfer DOS from one disk to another thereby saving a blown disk when all that's blown is DOS itself; or to restore a portion of a blown disk from its backup disk.

Its unique NIBBLE read routine provides a Hi-Res graphical representation of the data on any track allowing you to immediately ascertain whether your disk is 13 sector or 16 sector. Get an I/O error...is it because you have the wrong DOS up? is it because of a bad address field? or a bad data field? or because a track was erased? This will allow you to tell in an instant without blowing away any program in memory.

The **INSPECTOR** even lets you search through an entire disk or through on-board memory for the appearance of a string. Now you can easily add lower case to your programs (with LCA).

Do you want to add so-called illegal line numbers into your program? or have several of the same line numbers in a program (like the professional programmers do)? or input unavailable commands (like HIMEM to Integer Basic)? or put quotation marks into PRINT statements? Here's the easy way to do them all!

AND MORE

The **INSPECTOR** provides a USER exit that will interface your own subroutines with those of the **INSPECTOR** itself. For example, just put a screen dump routine (sample included in documentation) at HEX 0300 and press CTRL-Z. The contents of the screen page will print to your printer.

ROM RESIDENT ROUTINES

The **INSPECTOR** utilities come on an easily installed EPROM. This makes them always available for instant use. No need to load a disk and run a program.

FULLY DOCUMENTED

Unlike other software of its kind, The **INSPECTOR** comes with an EASY to understand manual and reference card. Examples and graphics help even the uninitiated use the power of these utilities. And furthermore, we offer the kind of personal service which you have never experienced from a software vendor before.

CIRCLE 202 ON READER SERVICE CARD

See your LOCAL DEALER OR . . . Mastercard or Visa users call TOLL FREE 1-800-835-2246. Kansas residents call 1-800-362-2421. Or send $49.95. Illinois residents add $3 sales tax.

SYSTEM REQUIREMENTS

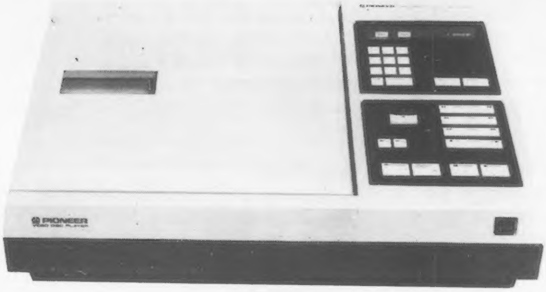
All Apple II configurations that have access to Integer Basic (either in ROM or RAM) will support The **INSPECTOR**. Just place the chip in empty socket D8 either on the mother board or in an Integer firmware card. Apple II+ systems with RAM expansion boards or language systems will receive the **INSPECTOR** on disk to merge and load with INTBASIC.

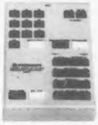
And...if you have an Apple II+, without either RAM or ROM access to Integer Basic, you will still be able to use The **INSPECTOR** because we are making available 16k RAM expansion boards at a very affordable price. Not only will you be able to use The **INSPECTOR**, but you will also have access to Integer Basic and other languages. Our price for BOTH the **INSPECTOR and our 16k RAM board is $169.95**, less than most RAM boards alone. Call our office for details.

Another Quality Product from
Omega Software Products, Inc.
222 S. Riverside Plaza, Chicago, IL 60606
Phone (312) 648-1944

© 1981 Omega Software Products, Inc.
Apple is a registered trademark of Apple Computer, Inc.

D





The Pioneer VP-1000.

The DiscoVision 7820.

This is achieved by the viewer keying the number of the frame or chapter into the player, either on its console, or via a remote control keypad. Even though the time required to access a particular program segment can range from two or three seconds to twenty seconds, a smooth, uninterrupted flow of information can be obtained either by using two disc players (with identical discs on each player), or by carefully designing a disc so that a minimum amount of physical space must be traversed when going from segment to segment. In either case, disc access time is distinctly preferable to tape spooling time.

Interactivity

How interactive should an interactive videodisc be?

The best answer might be the three levels of interactivity that have been defined by a major, publicly-funded disc project, the Nebraska Design/Production Group in Lincoln, NE. Part of Nebraska's educational television system, this group began in 1978 with a grant from the Corporation for Public Broadcasting to investigate the new videodisc medium. It produces experimental interactive discs, is fully-equipped for post-production assembly of discs, consults to producers entering the medium, and acts as a clearing house for technical and design information.

These are their definitions:

Level One videodiscs are discs designed to be used on a consumer videodisc player with the basic functions (still frame, slow, fast, scan, two audio channels, frame and chapter number search) used *manually*. This allows for menu selection, simple viewer options and branching, analytical sequences, single frame storage, etc. An important function of a Level One disc is that it can be coded so that these consumer players can be told to *stop* on a single frame to offer the viewer options or further instructions. (The two presently-available disc players, manufactured by Magnavox and Pioneer, as well as almost all industrial disc players, will respond to these hidden codes.)

Level One interactivity is the type of interactive disc which will probably be the most widely available to the general public, since no additional hardware is required to use the discs.

Level Two videodiscs are discs which are designed to be used with "industrial" videodisc players. These discs have all of the features of Level One, but are also encoded with short, prerecorded computer programs. These programs are *dumped* off the videodisc and into a rudimentary computer inside an industrial player. This type of player is offered by DiscoVision Associates (a corporation jointly-owned by MCA and IBM), and is built around a Fairchild F-8 microprocessor with approximately 1K bytes of memory. These computer programs are meant to "manage" the disc, and make very simple responses practical.

Here's an example of the advantage of these "smart" discs and players: Let's say three viewing options are offered in a Level One program. Each of these directs the viewer to a specific frame or chapter. To respond to this prompt, he will need to enter manually either the chapter number (one or two digits) or the frame number (up to five digits) on a control panel. Under internal program control, a Level Two program can offer options that need only a single keystroke in response, since the chapter and frame directives are defined in the computer program.

Several off-the-shelf interfaces between videodisc players and the Apple II microcomputer are currently available.

Level Three programs incorporate all the features of Levels One and Two, and use an intelligent videodisc player interfaced with a microcomputer. In this way, larger management programs can be used, and computer-generated graphics and text can be intermixed with the videodisc visuals. In some schemes, the on-screen video can be switched between the computer-generated material and the disc video. In others, the computer video can be mixed and superimposed with video on the disc.

Particular to Level Three, is the ability to gather and store (on magnetic floppy disk) viewer responses and data on how viewers select options. This way, a group of viewers can be polled, or the designer of an educational program can ascertain that students have viewed and understood its content.

These are convenient definitions of interactivity, but aren't necessarily exclusive. Discs designed only for frame storage, for example, can be used as visual databases in a Level Three system configuration, yet even these discs can be used by manually accessing the material they contain.

It is possible, then, to design an interactive videodisc that works on *all* levels, differently. Even though consumers will not achieve the same interactive experience that the users of computer-driven Level Three systems will get, a disc can reach a much wider audience, and none of the visual content will be lost.

Consumer vs. Industrial Players

How are "consumer" and "industrial" players defined?

There have been two generations of consumer players. Both were designed to offer limited access to the functions of the disc medium. The first of these was the Magnavox Magnavision disc player. Even though some experimenters have interfaced the Magnavox player with microcomputers, it is the most primitive of the LaserVision systems. Though all of the manipulative features—still frame, fast and slow motion, scan, etc.—are available, these features can only be operated from a group of keys on the front panel of the player.

The Pioneer VP-1000 player belongs to the second generation of consumer machines. Its design incorporates two badly-needed features: a hand-held remote control and the ability to call randomly any frame or chapter by entering a number on the player console or the remote. As a result, interactive programming is now easier to design for consumer use. The idea of using the disc for consumer-oriented single frame applications also becomes practical.

The Pioneer VP-1000 is sold as an industrial-quality player by DiscoVision Associates, which calls the machine its model 7810. DiscoVision began selling it in response to the needs of industrial clients for cheap, yet capable machines.

(The Pioneer, Magnavox and 7810 are priced in the $700 to $800 range.)

Three different players are marketed by DiscoVision Associates. Each is designated by the model number 7820. The 7820-1 is the original industrial player. It accepts programs about 1K in length loaded off the videodisc, and its longest access time in locating a frame or chapter is about 5 seconds. (Worst accesss time in the model 7810 and Pioneer VP-1000 is about 20 seconds.) The 7820-2 is faster, can randomly access segments in about 2.5 to 3 seconds, and its design improves upon the original by providing "handshaking"—a response from the disc player that the commands of an external computer have been received and executed—through its computer interface.

The model 7820-3 disc player is a further refinement on the original. It improves access time (albeit slightly) and adds a necessary computer instruction to its vocabulary. (The new instruction, "Branch on Fail," insures that the disc player doesn't "get lost" if it doesn't find the frame number or chapter number requested in a program. This could happen, for instance, when a disc is improperly replicated or mastered, and frame numbers are lost or garbled.)

Sony of Japan has recently begun manufacturing LaserVision-type discs and players. Sony's LDP-1000 is their first, and is an industrial-style machine. Unlike the DiscoVision players, though, the LDP-1000 uses an internal Z-80 microprocessor (on-disc programs, presumably, must be written in Z-80 code) and is oriented around a standard RS-232 serial interface. The Sony player is built to be basically compatible with other LaserVision discs. In other words, it will play them, though it won't recognize some codes that are commonly used, like chapter and frame numbers. Sony, at this time, has not announced plans for a consumer disc player.

Several off-the-shelf interfaces between videodisc players and the Apple II microcomputer are currently available. One is Omniscan, distributed by Aurora Systems, Madison, WI. The Omniscan board contains all the hardware to control the Pioneer VP-1000 (and DiscoVision 7810), and can switch between computer and disc video under software control. It retails for $250, and includes machine-code and Basic software, documentation, and the required cables.

Another board is offered by Allen Communications, Boulder, CO. This one interfaces the Apple to five different disc players, all those previously mentioned, except the Magnavox player. The board retails for $575, including software for interfacing to one of the machines. Additional software packages (for other players) are available for $50 each, and the board allows interfacing peripherals to the disc player and computer via its own RS-232 port. Allen Communications produces interactive discs, and consults to those who wish to design their own. The company is also active in refining and simplifying the "authoring" systems required in creating an interactive disc and computer program.

The picture produced by a videodisc exceeds the quality of other audio-visual media which have been available to educators in the past.

Other companies have developed their own hardware for computer/disc interface, too.

WICAT Incorporated, Orem, UT, designs and manufactures their own minicomputer system (around the Motorola 68000 microprocessor), and has long been active in computer-driven videodisc research. The Nebraska Videodisc Design/Production Group has fashioned its own computer interfaces, one of which is built around a TRS-80 microcomputer. The Interactive Television Company, Arlington, VA, has created several systems for videodisc applications such as data management, electronic libraries, geographic mapping and interactive movie viewing systems.

It is known, too, that Commodore International is hunting for a simple interface between its inexpensive VIC-20 microcomputer and consumer videodisc players.

Applications

It's one thing to invent hardware and dream up new systems, but what do you do with them?

Much of the basic work on interactive videodisc was done, not surprisingly, by educators. In Utah, a state with so much videodisc research that it has been nicknamed "videodisc valley," the University of Utah at Salt Lake, Utah State University, and Brigham Young University have all pursued projects that stem from their development of computer-aided instruction (CAI) programs.

The goal of all of these projects was to arrive at automated teaching systems which might displace (or at least enhance) many of the traditional classroom environments. The proponents of CAI often state that people learn better when they learn at their own pace. Another generally-held tenet, used particularly in support of interactive videodisc, is that the higher the fidelity of the automated image, the stronger the transfer of learning. Fidelity is an apt term, since, the picture produced by a videodisc exceeds the quality of other audio-visual media which have been available to educators in the past.

A look at the way in which interactive discs will filter down to consumers can be seen in two discs produced for Optical Programming Associates (OPA), a consortium of MCA, Philips and Pioneer, set up to demonstrate the possibilities of the LaserVision system.

"How to Watch Pro Football," is the rather prosaic title of the first interactive disc produced by the National Football League for OPA. The NFL has long used motion picture film and analytic movie projectors to teach players and coaches from "game films," and this approach is carried through to their videodisc. One chapter uses the two audio channels for alternate descriptions of the same football play. Another chapter is a collection of single frames of the pages of an NFL playbook. Another is a game called "Freeze When," which teaches the necessity of anticipating what kind of play will be run. There are also quizzes on the disc, using one audio channel for the questions and the other for answers.

The OPA football disc isn't for everyone. It is a tough, technical discussion of football, suited for the most serious of fans and students of the game. But it does demonstrate how very complicated topics can be organized for interactive viewing.

A very different approach makes the "First National Kidisc" (OPA's second

IF YOU'RE READY FOR ASSEMBLY LANGUAGE

then read what the experts say about Walt Weller's **PRACTICAL MICROCOMPUTER PROGRAMMING** series...

*"**PRACTICAL MICROCOMPUTER PROGRAMMING: THE 6502** stands out like a pearl among peas... What makes this work even more amazing is that it comes with its own editor/assembler/Debug package... It has been more helpful to me than all the other books put together, was a pleasure to read and came with nifty software to boot... At $32.95 this book is a true bargain."*

NIBBLE **October '81**

"This book is the best and most lucid introduction to Z80 programming that we have seen."

Digital Design **September '79**

"This is an EXCELLENT book... this book is a must for all Z80 users... dirt cheap for such great software and documentation."

CACHE **November '78**

"It was apparently Mr. Weller's goal from the beginning to present the fundamental concepts of assembly language programming in a completely nonthreatening way. He has accomplished this better than any author to date... Practical Microcomputer Programming is a very powerful series. It is well written and full of essential techniques for the assembly language programmer."

BYTE **October '79**

PRACTICAL MICROCOMPUTER PROGRAMMING: THE 6502 $32.95

20 chapters, 6 appendices, 474 pages. This book applies to any 6502 based computer but is written around the Apple II. Special chapters on graphics and cryptography are included. Source code for a full editor/assembler and debug are included. APPLE II object code is sent to the reader **FREE** when the coupon from the back of the book is returned.

PRACTICAL MICROCOMPUTER PROGRAMMING: THE Z80 $32.95

18 chapters, 4 appendices, 481 pages. This book applies to any Z80 based computer. It contains special chapters on graphics and decimal arithmetic. The Z80 is treated as an 8080 extension which means that you don't have to throw away your hard won 8080 knowledge because of a language change. Source code for a full editor/assembler and debug is included in appendices. TRS-80 cassette or paper tape object code is sent to the reader **FREE** when the coupon from the back of the book is returned.

PRACTICAL MICROCOMPUTER PROGRAMMING: THE INTEL 8080 $23.95

18 chapters, 3 appendices, 318 pages. This book covers assembly language technique for the popular 8080 family computers. In addition to fundamental topics it contains special chapters on point by point control of a matrix printer and manipulation of A/D converters.

PRACTICAL MICROCOMPUTER PROGRAMMING: THE M6800 $23.95

16 chapters, 2 appendices, 301 pages. This book contains a full treatment of fundamental assembly language topics for the popular M6800 computer as well as special chapters on fast low precision trigonometry and random number generation.

AND IF YOU'RE JUST GETTING STARTED...

ASSEMBLY LANGUAGE PROGRAMMING FOR THE APPLE BASIC USER $9.95

This 150 page paperback will get you started in assembly language gradually and easily with simple program exercises that relate assembly language principles to your BASIC experience. If you decide to go on from here the book contains a coupon that entitles you to $3.00 off the price of any other Northern Technology Books publication.

Send coupon and check or money order to:
Northern Technology Books
Box 62
Evanston, IL 60204

☐ Check enclosed ☐ Money order enclosed

☐ **PRACTICAL MICROCOMPUTER PROGRAMMING: THE 6502**	$32.95
☐ **PRACTICAL MICROCOMPUTER PROGRAMMING: THE Z80**	$32.95
☐ **PRACTICAL MICROCOMPUTER PROGRAMMING: THE INTEL 8080**	$23.95
☐ **PRACTICAL MICROCOMPUTER PROGRAMMING: THE M6800**	$23.95
☐ **ASSEMBLY LANGUAGE PROGRAMMING FOR THE APPLE BASIC USER**	$ 9.95

Name ______________________________

Address ______________________________

City ______________ State ______________ Zip ______________

US funds on a US bank only. No COD. Illinois residents add 6% sales tax.

CIRCLE 153 ON READER SERVICE CARD

program) even more fascinating. "Kidisc" is a collection of 22 games and activities for children, and is probably the most impressive program yet developed for the medium. Rather than asking for responses, this disc invites a child to play with it.

Each of the chapters demands that the viewer use it in a different way. Detailed instructions for making 11 paper airplanes are shown as groups of sequential still frames. Key phrases and the alphabet in manual language (sign language) are learned by watching a segment in slow motion. Two target games help develop a child's eye-hand co-ordination, and several chapters are collections of single frames—a flag and dinosaur quiz, and other chapters include puzzles and games.

Yet "Kidisc" is free from any confusing instructions. Its approach is simple, but elegant.

More concentration is required to use an experimental catalog published by Sears, Roebuck and Company. Sears, which is always looking for alternatives to its printed catalogs, took many of the sections of its Summer 1981 catalog, and organized it on an interactive disc. The disc was used as a market test in stores, and was given to Pioneer disc player owners for evaluation.

Naturally, much of the Sears disc is single frames, each of which describes a product that Sears sells. In addition to 5000 of these frames, however, the designers of the disc chose to include 12 real-time motion sequences to demonstrate certain products. One such chapter is a women's fashion show. Others demonstrate wireless telephones, toy sailplanes, and backyard barbeque cookers. The organization of the Sears disc requires attentive viewing, since so many of the actual catalog frames make references, back and forth, to other frames. Some of these references necessitate a great deal of keypunching to get to where you want to go on the disc. Five thousand single frames can be a staggering amount of information.

Even more impressive is a visual database called "Patsearch," a project of Pergamon, the British publishing company, and Online Computer Systems, Germantown, MD. "Patsearch" is a visual record of 700,000 U.S. patents which is accessed by a computer dial-up. The host computer, in turn, controls a videodisc player. A series of videodiscs contains the corresponding illustrations for each of these patents. The discs, as well as the computer database, are periodically updated to keep the system current.

Computer-control of disc players is also the heart of a unique, game-like simulator designed by Perceptronics, Woodland Hills, CA. The concept of using a computer game to train military personnel isn't a new one, but Perceptronics' "Tank/Gunnery Trainer," goes one step further.

It uses realistic film segments, stored on videodisc, as well as computer graphics. The scenes on the videodisc depict perspective views from inside a tank. When the operator moves or turns the tank, the video responds appropriately. When a tank is fired upon (with computer-generated shells), a direct hit yields the realistically gruesome results.

The trainer was created under a U.S. Department of Defense contract, and offers distinct advantages. Training a soldier in a real tank, firing real shells, is expensive—the trainer slashes these costs. More important, though, the trainer is designed to be a competitive, fun activity, and, in fact, has been installed in Army post dayrooms, to stimulate play among servicemen. (To add "bells and whistles" to the game aspects, Perceptronics has even incorporated the electronic voice of "crusty Sgt. McCoy," a southern-accented Army NCO who barks at players in a gruff, salty manner.)

The most unique and fascinating interactive disc project may be the creation of "vicarious travel experiences," the work of Massachusetts Institute of Technology's Architecture Machine Group.

One of the MIT travel systems is a "movie map," or visual tour, of Aspen, CO. Aspen was chosen because of its relatively small size and grid-like street layout. Thousands of feet of motion picture footage, and thousands of individual frames were shot of the city's streets and buildings. Viewing the "movie map," you can drive down a street, turn corners, stop, or enter a public building. It also gives the viewer the opportunity to see short films about aspects of life in the city, or even fly over Aspen via a computer graphic simulation.

> ***"Kidisc" is free from any confusing instructions. Its approach is simple, but elegant.***

What's Ahead?

Naturally, these are just a few of the applications of interactive videodisc. Most industry watchers agree that the number of these projects will only increase during the coming months and years.

Optical Programming Associates will continue to create new disc programs aimed at the consumer. The next of these are an aerobic dance disc, and "Master Cooking," an instructional cooking disc incorporating a still frame recipe file, and other interactive elements, presided over by chef Pierre Franey and food critic Craig Claibourne.

Special effects master Douglas Trumbull ("Close Encounters," "2001," and "Silent Running") is presently consulting with MCA Videodisc on a series of interactive programs, though, like Trumbull's other projects, these remain under wraps for the time being.

In the future we may see more releases similar to the ambitious production, a tour of the National Gallery of Art, which features thousands of single frames, including virtually every piece in the Gallery's extensive painting collection. It is presently available from Videodisc Publishing, NY.

Online Computer Systems hopes to enter the home with the concept of its visual databases, via a system called "Discover II." "Discover" will permit a home user to dial a computer database which will give a videodisc tour of American colleges, technical schools and universities, helping high school students select colleges and careers. Online hopes to have the visual portion of the system—corresponding videodisc—available through school and public libraries, and plans to have the system operational (with data on schools in ten states available) during 1982.

The more distant future presents even greater potential for videodisc. At present, "sound over stills" is under development. This new disc encoding technique would make dozens of hours of sound, as well as thousands of single frames, available on one disc. This would be accomplished by digitally encoding audio data within one television frame, and using an inexpensive "black box" to convert the frame back into sound. Using this technique, a hundred-hour college course, for example, could be packaged on just a few disc sides.

One inevitable question arises: Will it be possible to record on a videodisc? The answer, at least for now, is no, but practically every manufacturer of videodisc hardware has a disc *recorder* under development. Most of these designs use a slightly more powerful laser to write information on a special disc. Matsushita of Japan has already shown a working prototype of such a recorder, though it can only record still frames at present. Since the digital data storage capacity of a videodisc is so great (reportedly a theoretical 20 gigabits), this is one area of research which will surely continue. (Some of the thinking in this direction imagines a disc as a gigantic Write Once, Read Only Memory. A WOROM?)

The real future of videodisc can't be predicted, though. Perhaps VHD (or another system not yet developed) will challenge the superiority of today's LaserVision system. And there are still solid-state devices, like bubble memories, that may make discs totally obsolete.

For now, the videodisc is a true wonder, but one which is waiting for our imaginations to catch up with its capabilities. □

APPLE • ALTOS • ATARI • MAXELL • DYSAN • EPSON • CCS • SHARP • CASIO • HP • VERBATIM • MEMOREX • SOROC • CORVUS • ADDS

BMC • CENTRONIC • NEC • HAZELTINE • AMPEX • VERBATIM • HITACHI • HAYDEN • CANON • NOVATION • D.C. HAYS MICROCOMPUTERS • PAPER TIGER • PERSONAL SOFTWARE • GTE •

MICRO

BUSINESS WORLD INC.
Information Line (213) 996-2252
TOLL FREE MAIL ORDER LINES
(800) 423-5886 Outside Calif.

COMPUTERS

apple computer

	List	Our Price	SAVE
Apple II-16K	$1330.00	$999.00	$331.00
Apple II-32K	1430.00	SPECIAL	$
Apple II-48K	1530.00	CALL	$
Apple II-64K	1725.00		$
Apple III 128-K	3915.00	2997.00	918.00
ALTOS 8CS 8000-15	5990.00	4450.00	1540.00
SHARP-64K Z80 FULL KBD YX-3200			CALL
NEC PC 8001	1295.00	1050.00	245.00

ATARI PERSONAL COMPUTERS	List	Our Price	SAVE
400 16K Bytes of Ram	595.00	337.45	257.05
800 16K Bytes of Ram	$1080.00	739.00	332.00
410 Program Recorder	90.00	77.00	13.00
810 Disk Drive	600.00	457.00	143.00
825 Printer (80 col-Centronic 737)	999.95	769.00	230.00
820 Printer (40 col impact)	450.00	353.00	97.00
830 Acoustic Modem	200.00	155.00	45.00
850 Interface Module	220.00	192.00	48.00
Atari Visicalc	200.00	164.00	36.00
Atari 400-16K	595.00	327.00	304.00

HEWLETT PACKARD	List	Our Price	SAVE
HP-125 Microcomputer	3750.00	2990.00	760.00
HP-85 Microcomputer	3250.00	2475.00	775.00
HP-83 Microcomputer	2250.00	1777.00	473.00
16K Exp-Memory Module	295.00	255.00	40.00
Graphics Plotter 7225	2450.00	2075.00	375.00
Personality Mod. for 7225	750.00	665.00	85.00
2631B Impact/printer/hvy dty	3950.00	3250.00	700.00
Option 020 for 2631B	150.00	125.00	25.00
8 Drives to choose from 82902S	1300.00	1125.00	195.00
9895A 8" Dual Drive	6850.00	5500.00	1350.00
Graphics Tablet 9111A	2050.00	1678.00	374.00
HP-41 CV New 2.2 bytes mem	325.00	250.00	75.00
HP-41-C Calculator	250.00	185.00	65.00
Card Reader for 41CV/C	215.00	162.00	53.00
Printer for 41CV/C	385.00	289.00	101.00
Optical Wand for 41 CV/C	125.00	97.00	28.00
Quad Ram equals 4 Mem. Mods	95.00	81.00	14.00
Memory Modules for 41C		25.00	$
HP-97 Programble Printer	750.00	595.00	175.00
HP-67 Programble Calculator	375.00	295.00	80.00
HP-34C Programble Scientific	150.00	117.00	33.00
HP-38C Programble Bus. R/E	150.00	117.00	33.00
HP-32E Adv. Scientific	55.00	48.00	7.00
HP-37E Business Mgmt.	75.00	57.00	18.00

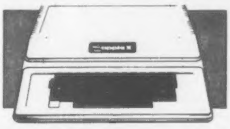
We carry a large inventory of Libraries, accessories and supplies.

PRINTERS

	List	Our Price	SAVE
EPSON			
MX 80 FT	745.00	549.00	196.00
MX 80 IMPACT	645.00	450.00	195.00
MX 70 IMPACT	500.00	390.00	110.00
MX 100	995.00	765.00	230.00
APPLE SILENTYPE	645.00	299.00	346.00
ANADEX 9501	1650.00	1299.00	351.00
NEC			
5510	3195.00	2445.00	750.00
5515	3295.00	2545.00	750.00
3510	2495.00	1795.00	700.00
3515	2545.00	1849.00	696.00
OKIDATA			
MICROLINE 80	545.00	395.00	150.00
MICROLINE 82	649.00	549.00	100.00
MICROLINE 83	1050.00	769.00	281.00
PAPER TIGER			
445G with Graphics	795.00	695.00	100.00
460G with Graphics	1,394.00	899.00	495.00
560G New full size	1,695.00	1,139.00	556.00
DIABLO (LETTER QUALITY)			
630 R102 bi-directional tractors	2,965.00	2,350.00	615.00
1640K109 keyboard tractors	4,000.00	2,899.00	1,100.05
630 RO Receive Only	2,710.00	2,250.00	460.00
1650K 136 keyboard tractors	4,000.00	3,100.00	900.00

SPECIAL OF THE MONTH

APPLE II PLUS
48K W/16K
EXPANSION BOARD
= 64K



Our price $1199.00

List price $1780.00
Our price $1199.00
Save $581.00

APPLE II STUDENT SYSTEM

- Apple II Plus System-48K RAM
- Disk II Floppy Disk & Interface (DOS 3.3)
- 12" Grn. Phs. Video Monitor

SAVE $655

List $2450.00

Our Price $1795

MONITORS

	List	Our Price	SAVE
NEC Grn. Phs. 12"	$285.00	239.99	$46.00
BMC Green Phs. 12"	275.00	229.00	46.00
Zenith 12"	159.00	119.00	30.00

SANYO MONITORS
High Resolution, Number 1 seller

	List	Our Price	SAVE
13" Color (new) high quality	$550.00	388.00	$162.00
12" Green Phosphorous	360.00	240.00	120.00
12" Black & White	340.00	217.00	123.00
15" Black & White	370.00	235.00	135.00
9" Black & White The Best Seller!	235.00	145.00	90.00

DISKETTES

SOLD IN BOXES OF 10
(Min. Purchase)
BUY $100 of the Following Diskettes

	List	Our Price	SAVE
	PRICE PER DISKETTE		
DYSAN			
104 1 5" SOFT SECTOR	$ 6.00	3.99	$ 2.01
104 1D = " DBL DEN.-SOFT SEC	6.40	4.60	1.80
3740 1 8" SOFT SECTOR	7.25	4.75	2.50
3740 1D 8" DBL DEN.-SOFT SECTOR	10.75	6.90	3.85
MAXELL			
MD-1 5" SOFT SECTOR/DBL. DEN	5.00	4.00	1.00
MD-2 = " SOFT SECTOR/DBL. SIDE DBL. DEN	7.00	4.90	2.10
FD-1 8" SOFT SEC. DBL. DEN	6.50	4.50	2.00
FD-2 8" SOFT SEC. DBL. SIDE/DBL. DEN	8.50	5.95	2.55

TERMINALS

TELEVIDEO	List	Our Price	SAVE
910	699.00	599.00	100.00
912C	950.00	699.00	251.00
920C	995.00	795.00	200.00
950C	1,195.00	949.00	246.00

DRIVES

CORVUS			
5 MBYTES	3,750.00	3,050.00	700.00
10 MBYTES	5,350.00	4,449.00	901.00
20 MBYTES	6,450.00	6,450.00	1,125.00

1 Year Extended WARRANTY
$99.00
INQUIRE

$AVINGS
$ERVICE
$ELECTION
$ATISFACTION

MEMBER BBB

SOFTWARE

FOR APPLE II

	List	Our Price	SAVE
Apple Fortran	$ 200.00	$ 147.00	$ 53.00
DOS 3.3 (16 Sector)	60.00	45.00	15.00
Apple PILOT (16 Sector)	150.00	119.00	31.00
Apple FORTRAN (requires A2B0006) (16 Sector)	200.00	159.00	41.00
Language System with Apple Pascal	495.00	399.00	96.00
BPI General Ledger System	395.00	319.00	76.00
BPI Inventory Package	395.00	319.00	76.00
Visidex	200.00	159.00	41.00
Visicalc	200.00	159.00	41.00
Desktop Plan II	200.00	159.00	41.00
Microlab Database System	150.00	119.00	31.00
Stoneware DB Master	229.00	189.00	40.00
Muse Supertext II	150.00	119.00	31.00
Softape Magic Window	99.00	72.00	27.00

TEXAS INSTRUMENTS

TI 99/4A Console New Improved	950.00	385.95	564.05
10" Color Monitor High Resolution	374.95	317.95	57.00
32K Memory Module	399.95	312.95	87.00
Speech Synthesizer	149.95	127.95	22.00
Disk Memory Drive	499.95	390.95	109.00
RF Modulator	49.95	42.50	7.45
Telephone Coupler (Modem)	224.95	185.95	39.00
Printer (Solid State)	399.95	315.95	84.00

MODEMS

NOVATION CAT MODEM	189.95	140.00	49.95
NOVATION D-CAT	199.00	150.00	49.00
NOVATION APPLE-CAT	349.00	310.00	39.00
HAYES MICROMODEM	379.00	295.00	84.00
HAYES SMARTMODEM	279.00	239.00	40.00

CALCULATORS

CASIO			
HR-10	49.95	39.00	10.95
HR-12	54.95	42.00	12.95
FR-100	79.95	59.00	20.95
FR-1210	129.95	99.00	30.95
PQ-20	29.95	23.00	6.95
LC-785	12.95	10.00	2.95
LC-3165	12.95	10.00	2.95
FX-68 Scientific	29.95	23.00	6.95
FX-81 Scientific	19.95	17.00	2.95
FX-3600P Scientific	39.95	29.95	10.00
FX-602P "Computer Talk" 88 Memories Programming Upper & Lower Case Dot Matrix	129.95	99.00	30.95
FX-702P Solves Problems with Alpha-Numeric Clarity, uses Basic Language	199.95	159.00	40.95

TELE. ANSW. DEVICES

PHONE MATE			
900	119.95	86.00	33.95
905 Remote	199.95	144.00	55.95
910	159.95	115.00	44.95
920	199.95	144.00	55.95
925 Remote	239.95	173.00	66.95
930 Remote	299.95	216.00	83.95
950 Remote	339.95	245.00	94.95
960 Remote	399.95	288.00	111.95

MICRO BUSINESS WORLD MAIL ORDER WAREHOUSE
18720 Oxnard, #108 Tarzana, CA 91356
Telex: 182852
Answer: MICRO TZNA

OUTSIDE CA CALL TOLL FREE 1 (800) 423-5886 IN CA (213) 996-2252

Name (Please Print) ______
Address ______
City ______ State ______ Zip ______

Qty	Make	Model	Description	Price	Total

TOTAL ORDERS ______
TAX IF APPLICABLE* ______
SHIPPING & HANDLING** ______
TOTAL ENCLOSED $ ______

*California residents add 6% sales tax
**Add 3% for Shipping & Handling — Add 3% surcharge for credit cards. Orders cannot be shipped unless accompanied by payment, including shipping handling and tax where applicable

Certified Check or M.O.
Bank Wire Transfer

Cash/Credit Card(Allow 2 weeks clearance for checks)

CREDIT CARD # ______
Exp. Date ______ Signature ______

We reserve the right to correct typographical errors. This ad supercedes all previous ads.

HP • D.C. HAYS MICROCOMPUTERS • PAPER TIGER • GTE • DIABLO • BMC • CENTRONIC • NEC • HAZELTINE • MEMOREX • AMPEX • PERSONAL SOFTWARE • ADDS • XEROX • DIABLO

MAXELL • DYSAN • EPSON • CCS • SHARP • CASIO • HP • VERBATIM • MEMOREX • SOROC • CORVUS • PERSONAL SOFTWARE • CCS

CIRCLE 306 ON READER SERVICE CARD

This Months Special

Okidata Microline 80

At a New Low, Low, Price!

Microline 80

A great buy

– List Price is **$449.** The **Microline 80** is a quiet, small printer with field proven reliability.

Features:

- Friction & pin paper feed, roll or fan fold
- Prints expanded characters and block graphics
- Print speed 80 characters per second
- Printhead rated at 200 million characters continuous cycle
- 132-column compressed print
- Available RS-232C Serial Interfaces:

	LIST
ORS-256 (256 Character Memory)	$109.00
MSP-100 (Unbuffered, Switch Select Data Rates)	$120.00
MSP-200X (200 Character Memory)	$215.00
MSP-2000X (2000 Character Memory)	$300.00
Other available options:	
Adjustable Tractor Feed - Model 54100201	$ 50.00
TRS-80 Parallel Output, cable to printer	$ 35.00
Ribbons	$ 3.00

TRANSFORM YOUR COMPUTER

into a Word Processing or Data Processing System by adding one of the NEW Okidata Printers

Microline 83A

Microline 82A

If you require a system printer, the new Okidata Microline 82A, 83A, 84 should be your choice.

These printers feature:

- 9 x 9 Dot Matrix heads rated at 200 million characters continuous duty - true lower descenders
- Full forms control – vertical tab, top of form
- Block Graphics
- Bidirectional, Short Line Seeking
- Dual Interface – Parallel & RS-232C Serial

	LIST
Microline 82A – 80-column, 120 characters per second	$ 649.
Tractor Optional	$ 50.
Microline 83A – 136-column, 120 cps, built-in tractor	$ 995.
Microline 84 – 136-column, 200 cps, built-in tractor	$1395.
Optional Serial Interfaces – RS-232C:	
HS-RS232 – 256 Character Buffer	$ 150.
HS-RS232 – 2K Character Buffer	$ 180.

THE STOCKING SOURCE

ASK FOR OUR INSTANT DISCOUNT
From Roy Hawthorne
Talk To Bill Tokar On Applications

CALL TOLL FREE
U.S.A.
1-800-521-2764
MICHIGAN
1-800-482-8393

Remember:
We are open
8:30 AM to
6:00 PM EST
Monday – Friday

No Credit Card Penalty

"The Stocking Source"
24069 Research Drive
Farmington Hills, MI
48024
313-474-6708

CIRCLE 233 ON READER SERVICE CARD

This man is looking for AN ELECTRONIC BREAKTHROUGH.

Join him in the incredible world of electronics with NRI's all-new training in the career of the future...Electronic Design Technology.

It's an electronic world we live in. And the designers of electronic circuits, controls, and systems are the people who are shaping it. Take your place in this exclusive company with this exciting new training from NRI.

You can learn Electronic Design Technology at home, in your spare time. Without quitting your job, tying up your evenings at night school, or wasting gas traveling to classes. Because NRI comes to you, makes you a class of one with a complete, effective, low-cost learning program designed exclusively for home study. You get it all...at your convenience.

Hands-On Training

NRI trains you for action. You get real-life experience that builds priceless confidence, gives you working knowledge of lab practices and techniques. It's all built into the NRI Design Lab,® a complete combination of equipment, hardware, training, and reference materials. You'll design your own circuits from the very beginning, progressing from basic passive networks through key circuits like power supplies, amplifiers, oscillators, digital and logic circuits, phase-locked loops and more. You'll move on to linear and digital integrated circuits, the heart of modern electronic equipment. You'll prototype your designs and verify operation, learning professional test and measurement procedures as you progress.

Training includes NRI Design Lab, Beckman digital multimeter, Texas Instruments scientific calculator that you use and keep.

Professional Equipment Included

All the way, you work with professional-quality instruments like the Beckman 6-function, 26-range LCD digital multimeter. It gives you fast, accurate measurements of voltages, currents, and resistances, even forward voltage drops across in-circuit diodes and transistors.

You'll breadboard your designs on the unique NRI Circuit Designer. It features built-in multiple power supplies, variable signal generator, logic switches and LED indicators. It handles almost any circuit you can design...linear and digital integrated circuits as well as discrete components such as transistors and diodes.

Analysis and design work is speeded with the Texas Instruments TI-30 scientific calculator. This engineer's instrument includes full trigonometric functions, logarithms, square root, squares, powers, memory, and more. All this fine equipment is part of your training, yours to keep and use in your work.

NRI Fast-Track Training

This is the unique NRI lesson concept that simplifies and speeds learning. From the very basics to advanced, state-of-the-art electronics, each lesson is especially prepared for individualized instruction. Each subject is covered fully and thoroughly, but extraneous material is eliminated, language is clear and to the point, organization is logical and effective. From Fundamentals of Electronic Circuits through Microprocessors, your lessons are designed with you in mind.

No Experience Necessary

You don't have to be an engineer (or even a college student) to succeed. High school graduates with some algebra handle it without any trouble. We start you at the beginning, let you advance just as quickly as you're ready. We even include the NRI Math Refresher Module to help you brush up on your math and teach you any new concepts you may need.

Free Catalog, No Salesman Will Call

Our free, 100-page catalog gives you all the details, including lesson outlines, equipment specifications, and career opportunities. Send for it today and find the breakthrough for your future. If card has been removed, please write to us.

NRI SCHOOLS
McGraw-Hill Continuing
Education Center
3939 Wisconsin Avenue
Washington, DC 20016
We'll give you tomorrow.

Videodiscs in the Classroom:

An Interactive Economics Course

Kent T. Kehrberg and Richard A. Pollack

Perhaps the most often-mentioned use for the combination of videodisc and computer is education. And while others have been mentioning it, the Minnesota Educational Computing Consortium has been implementing the technology in classrooms across the state. Here the project director describes the development of an economics course using Apples and videodisc players. —EBS

The Special Products Division of the Minnesota Educational Computing Consortium (MECC) is charged with the task of researching and developing new uses for computers in education. With a grant from the Rockefeller Family Fund, we embarked on a project to develop a high school economics unit to be delivered by a microcomputer and videodisc player. This article describes our project, specifically the materials we developed and the process we used to develop them.

Declining enrollments and corresponding reductions in funds have meant changes in many school districts. In the past a school could offer a great variety of courses, including those taken by only a few students. Now, tightened school budgets make it impractical to provide this variety in the traditional manner.

Small rural schools have been particularly affected. Yet, should students be deprived of an enriched education because they live in a sparsely populated area or attend a small school? Perhaps technology has a solution to this problem.

The videodisc adds tremendous potential to traditional computer-assisted instruction.

Application of Technology

The purpose of our project is to apply the evolving technologies of the microcomputer and the videodisc player to educational problems caused by declining enrollments. A course frequently eliminated because of reduced enrollments is economics, which is often taught as an elective in the social studies area. Although an important course, economics is, unfortunately, one which attracts few students and one which few social studies teachers are well trained to teach. Therefore, economics seemed a good subject area in which to develop courseware making use of new computer technologies.

Keeping notes in the student manual provides a reference for the student and evidence of progress for the teacher.

We began by defining an economics course in terms of five units. The first unit, a general introduction, teaches students such concepts as resources, wants and needs, and scarcity. These ideas are taught during 11 student sessions, each of which covers one or two concepts and takes approximately 20 minutes of the student's time. The remaining four units will also consist of ten to fifteen sessions. The second unit is currently being developed with the other three to follow.

Three types of media are used in each session. A booklet introduces the lesson and directs the student to use the other pieces of equipment. At the same time, it provides space for note taking and record keeping. A microcomputer contributes tutorial, drill and practice dimensions to the lesson. And a videodisc player presents information, shows examples, and develops concepts which involve graphics or motion.

One of our objectives was to keep the cost of the project as low as possible. We chose an Apple II computer with a single disk drive. Although not as inexpensive as some cassette-based microcomputers, several thousand Apples were already being used in Minnesota schools. The Pioneer VP1000 LaserDisc system was also chosen for its low cost and because of the availability of an interface board (Available from Blue Lakes Sales, 3240 University Ave.,

---

Kent T. Kehrberg and Richard A. Pollak, Minnesota Educational Computing Consortium, 2520 Broadway Drive, St. Paul, MN 55113.

THE INCREDIBLE PRINTING MACHINE

Typrinter 221

IMAGINE a computer printer/electronic typewriter with a 100 character daisy wheel, controlled by 6 microprocessors (including 2 Z-80's) with an all-electronic keyboard...all in one machine!

THAT'S INCREDIBLE!
THAT'S THE TYPRINTER 221!

AUTOMATICALLY, IT WILL:

Center copy.
Line up decimal points.
Print vertical lines (to separate columns).
Layout columns.
Center titles (over a column).
Print flush right.
Return carriage (at end of line).
Paper feed to pre-set starting point.
Indicate end of page.
Set tabs from one to many.
Clear tabs from one to all.
Set temporary margins (wherever you like) as often as needed.
Repeat all typing keys as needed.
Underline copy.
Print bold face and underline.
Do reverse print (white on black), sort of "reverse Video".
Allow alphabetic and decimal tabulation.
Indent paragraphs.
Store in non-volatile resident memory:
  Often used line formats (margins & tab stops).
  Often used phrases (up to 835 characters) in 10 "bins".
  Up to 10 complete forms (tax, medical, insurance, etc.).
  Up to 14,000 characters in an additional 26 "bins*".
Print perfectly spaced proportional letters.
Return to typing position after correction with relocation key.
Allow one character to overlap another (0).
Right margin justification.
Print two columns with both right and left margins justified and the center ragged.
Lift off errors (from single character to entire line).

CIRCLE 190 ON READER SERVICE CARD

IT WILL EVEN:

Allow a carriage return without a linefeed or a linefeed without a carriage return.
Allow you to pre-set an impression control for high-quality carbon copies.
Allow both vertical and horizontal half-spacing.
Allow cancellation of copy before printing.
Allow express and normal backspacing.
Print in four different sizes: 10 pitch pica, 12 pitch elite, 15 pitch micron.
Allow insertion of a missing character in an already printed line.
Accept paper up to 17" wide.

Backspace 1/10, 1/12, 1/15 or even 1/60 of an inch.
Buffer and print out one word at a time, or one line or as many as 10 pages*.
Print up to 198 columns.
Do 1/2 line spacing for footnotes and scientific notation.
Accepts carbon film or reusable nylon ribbons.

IT HAS:

A lighted key to inform you that it's set to temporary margin.
A factory installed noise reduction shield.
A 16K buffer/automatic spooler*.
A lighted key to indicate upper case only.
A Centronics standard parallel interface and can be ordered with:

RS-232 Serial interface* or
IEEE (PET) interface*.

A print speed of 20 cps and (because of logic seeking circuitry) a through-put of approx. 32 cps.
A built-in anti-glare shield.

IT EVEN HAS:

Carbon film ribbons in various colors.
20 character plasma readout that informs you as to:
  Number of characters to end of line.
  Number of lines left to end of page.
  The existence of an error condition.
  The contents of a memory "bin".
  Number of characters left in buffer.
An automatic "feature in use" indicator (centering, storage, etc.)
With scrolling, both FORWARD and BACKWARDS.

INCREDIBLE?

THE 221 OFFERS EVEN MORE!

It's totally compatible with all computers and software.
It will print in English, French, Spanish, Italian and German. It will automatically switch between English and foreign keyboards*. (Under computer control).
Scientific, mathematic, financial and legal daisy wheels available*.
Tractor feed available*.
Can be used as a stand-alone terminal*.
Can be used to access both TWX and TELEX networks*.

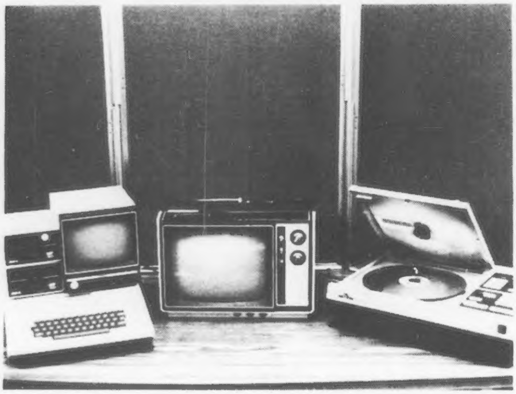
TRY WHAT YOU'VE BEEN MISSING.
TRY THE INCREDIBLE MACHINE.
TRY THE TYPRINTER 221.

Suggested price $2850.00
Dealer inquiries invited.
(Call for store nearest you).

Service available through the world-wide facilities of the Olivetti Corporation.

HOWARD INDUSTRIES

2051 E. CERRITOS AVE., 8-C
ANAHEIM, CA 92806
714/778-3443



The low-cost learning station consists of an Apple II and Pioneer Videodisc Player.

The student begins the lesson by placing the appropriate videodisc on the player.

Madison, WI) which allows it to be controlled by the Apple II.

The videodisc adds tremendous potential to traditional pieces of media equipment: slide, filmstrip and movie projectors, as well as audio and videotape players. One side of a videodisc has space for 54,000 frames; this is comparable to the number of frames on a 16mm movie film. Each videodisc frame, however, has an identifying number so it can be directly accessed. Single frames can be displayed like slides, and motion sequences can be presented by having the videodisc pass forward or backward over successive frames. Varying the speed of the player provides slow or fast action. When played at normal speed, a videodisc shows a half hour of motion material.

Student Interaction

A student begins a session by opening the appropriate lesson booklet. The printed material lists the lesson objectives, provides a few paragraphs of background material, and then directs the student to turn on the computer.

The computer displays additional text material and some questions to test the student's understanding. Then, at appropriate times, video material is presented from the videodisc player. The video material may be stills or motion sequences. It may present information, give examples, or provide a visual reference for test items.

The computer occasionally directs the student to make notes or to write answers to questions in the booklet. In this way the booklet serves as a reference for the student in reviewing the lesson and provides tangible evidence of the student's work for the teacher to review. Each session ends in the booklet where the student is directed to turn off the equipment.

Teachers may be as involved in the student's learning activities as they desire. The teacher can review a student's work after each session or wait until he completes the unit. In this manner the student can study economics under the direction of a classroom teacher who may actually spend most of his time teaching a larger class in another social studies area.

The Development Process

Designing courses that involve several different media is a challenging juggling act. What role should the computer play? When should video material be shown? How can the author convey the structure of the lesson content to computer programmers and video directors?

We solved this problem in two ways. First, each lesson was systematically laid out on paper without regard to the use of media. The various lesson components were then examined in light of the available technologies. If a picture could enhance a concept, then the videodisc was applied. When motion played a role in defining a concept, the videodisc was used again. Also, when information could be delivered efficiently through a short video interaction, the television was used. Finally, lists or definitions were printed in the student's booklet.

The second part of the juggling problem was solved by using color-coded sheets of paper. Material for the student booklet was written on green paper. Individual frame sheets for computer coding were written on white paper. Pink was used for television scripts.

By placing the sheets in the proper sequence, a person could read through the entire lesson prior to its production. When the lesson was approved, the white sheets could be given to the computer programmer and the pink sheets to the video director.

Producing the Videodisc

Although the typical lesson requires 20 minutes of student time, only two or three minutes of video material is used. This video material is divided into segments which are interspersed throughout the lesson time while work in the student booklet takes up the remainder.

The costs of producing video material vary with the quality desired. To the microcomputer programmer who is accustomed to creating new programs quickly by typing out a few lines of code, the costs of video production seem high. (Commercial costs range from $1000 to $3000 per minute of material.) We were able to reduce these costs in a variety of ways.

First, using a service called Encyclovideo, which cross-references existing film segments, we were able to locate material from films available through Encyclopaedia Britannica. The rights for short one or two-minute segments were secured and we then added our own audio track.

Also, rather than using commercial studios to produce new video sequences, we were fortunate in being able to work with the Osseo Public School District in Osseo, MN. Their well-equipped facilities allowed us to produce high quality segments at costs that were lower than those associated with commercial productions. The end product was a 3/4" videotape containing new video material along with modified 16MM film, slides, and graphic artwork. The videotape was the equivalent of a half-hour of material for the videodisc.

HUNTINGTON COMPUTING

ONE OF THE WORLD'S LARGEST INVENTORIES

GAMES

Hi-Res Soccer	$29.95	now	$25.39
Apple®-Oids	$29.95	now	$25.39
Wurst of Huntington Computing			$19.99
Gobbler	$24.95	now	$21.19
Ultima	$39.95	now	$33.89
Autobahn	$29.95	now	$25.39
Battle Cruiser Action	$44.95	now	$38.89
Gorgon	$39.95	now	$33.89
Super Stellar Trek	$39.95	now	$33.89
Hellfire Warrior	$39.95	now	$33.99
Gamma Goblins	$29.95	now	$25.39
Mission Asteroid	$19.95	now	$17.99
Wizardry	$49.95	now	$42.49
Star Mines	$29.95	now	$25.39
Warp Factor	$39.95	now	$33.99
Microsoft Adventure	$29.95	now	$25.39
Wizard and the Princess	$32.95	now	$28.99
Flight Simulator	$34.95	now	$29.49
Odyssey	$29.95	now	$25.39
Sargon II	$34.95	now	$29.69
Space Eggs	$29.95	now	$25.39
Hi-Res Cribbage	$24.95	now	$21.19
Lords of Karma (cass.)	$20.00	now	$16.99
Oh Shoot		now	$19.99
ABM	$24.95	now	$21.19
Computer Conflict	$39.95	now	$35.99
Computer Air Combat	$59.95	now	$52.99
Temple of Apshai	$39.95	now	$33.89
Zork	$39.95	now	$33.99
All Nibble Software			15% off list
Robot Wars	$39.95	now	$33.99
Cranston Manor	$34.95	now	$29.69
Dragon's Eye	$24.95	now	$21.19
Computer Acquire	$20.00	now	$16.99
Twala's Last Redoubt	$29.95	now	$25.39
Snoggle	$24.95	now	$21.19
Alien Rain	$24.95	now	$21.19
Alien Typhoon	$24.95	now	$21.19
Raster Blaster	$29.95	now	$25.39
3-D Skiing	$24.95	now	$21.19
Creature Venture	$24.95	now	$21.19
Galaxy Space War I	$39.95	now	$33.99
Hodge Podge	$23.95	now	$21.29
Meteoroids in Space	$19.95	now	$16.99
Dragon Fire	$49.95	now	$42.49
Pool 1.5	$34.95	now	$29.69

MISCELLANEOUS

Escape from Acturus	$29.95	now	$25.39
Basic Mailer	$69.95	now	$59.49
Memory Management II	$49.95	now	$42.89
Castle Wolfenstein	$29.95	now	$25.39
Upper Reaches of Apshai	$19.95	now	$16.89
Bridge Tutor	$39.95	now	$35.19
PASCAL Animation Tools			$65.99
Hand Holding BASIC			$84.99
UT-100 Emulator			$65.99
Space Quark	$29.95	now	$25.39
Beneath Apple DOS (book)	$19.95	now	$16.89
Dinosaurs (cass.)	$24.00	now	$20.39
Birth of the Phoenix	$14.95	now	$12.69
Goblins	$27.50	now	$23.29
Painter Power	$39.95	now	$33.89
U.S. Constitution	$29.95	now	$25.39
Merger	$49.95	now	$42.49
Super Stellar Trek	$39.95	now	$33.89
LISA	$79.95	now	$67.89
V-Plot (Yuccipa)	$29.95	now	$25.39
V-Stat	$29.95	now	$25.39
V-Print	$29.95	now	$25.39
Brain Surgeon	$49.95	now	$42.49
Info Master	$150.00	now	$127.49
Waterloo II	$49.95	now	$42.39
Fantysland 2U41	$59.95	now	$50.99
Torpedo Terror	$24.95	now	$21.19
Speedstar	$139.95	now	$114.69
Kaves of Karkhan	$49.95	now	$42.39
Dos Boss	$24.00	now	$20.39

WORD PROCESSORS

Apple® Writer			$65.99
Magic Window	$100.00	now	$84.99
Easy Writer Professional	$250.00	now	$219.00
Letter Perfect	$150.00	now	$127.49
Super Text	$150.00	now	$127.49
Superscribe	$129.95	now	$110.39
Apple® Pie (All Versions)	$129.95	now	$99.99
Executive Secretary	$250.00	now	$212.49
Apple® Wordstar	$375.00	now	$286.00
Hebrew II	$60.00	now	$50.99
Apple® Writer Extended	$29.95	now	$25.39

Softlights

By Fred Huntington

Welcome to the world of Huntington Computing and the first Softlights column.

To celebrate our first column we are offering **Space Eggs** and **Apple Panic** for only **$19.99** each (list $29.95). You must mention this ad to get the special price. Shipping (usually UPS) for software is $2.00, no matter how large the order. UPS Blue Label is $3.50. Foreign shipping (except for Canada and Mexico) and hardware shipping are extra.

Huntington Computing started out a year-and-a-half ago as a mom and pop outfit. We now employ close to fifty people. We think we have the largest selection of software for the Apple® in the world.

Check the reader service card for a free catalog of software for the Apple®. We also are now carrying a large selection of software for the Atari®, TRS-80® and Pet® but don't have a catalog yet.

We have fast service, the best guarantee in the business and friendly personnel.

Our store hours are 7 a.m. to 9 p.m. (P.S.T.) on weekdays and 10 a.m. to 5:30 p.m. on weekends and holidays (except Christmas). Usually, however, we're here much beyond those hours and can even be reached in the middle of the night occasionally. We do not employ an answering service or an outside ordering service.

We want your business and will do what we can to get it and keep it.

Got a pre-schooler? Our two-year-old loves **Hodge Podge** by Dynacomp – only **$20.99** (list $22.99). Our vote for favorite arcade-type game is **Sneakers.** A lot of people, however, tell us they get addicted to Apple Panic.

Business systems? We took a handful to our C.P.A. and he chose the **Continental General Ledger** for us - **$212.49** (list $250.00).

Even if you don't see the software you want listed here or in our catalog, chances are we already have it in stock or can get it for you at a discount. We stock more than 1,000 different programs and add new ones every day.

COMING SOON!

California Toll-Free Number

800-692-4143

STOCK PROGRAMS

Portfolio Master	$75.00	now	$63.69
Market Charter	$129.95	now	$110.39
Dowlog for Market Charter	$99.95	now	$89.99
Investment Decisions	$99.95	now	$84.99
Stock Tracker	$190.00	now	$161.49
Stock Tracker (Auto. Ver.)	$300.00	now	$254.99

BUSINESS APPLICATIONS

Invoice Factory (Special)	$200.00	now	$149.00
Regression Trend Analysis	$26.95	now	$22.89
Multiple Regression	$29.95	now	$25.39
Microsoft Fortran	$200.00	now	$165.69
Microsoft Cobol-80	$750.00	now	$637.49
Business Pac 100	$99.95	now	$84.99
Desktop Plan II	$200.00	now	$169.99
Visicalc 3.3 Special	$200.00	now	$149.00
Visiplot	$179.95	now	$152.89
Visitrend/Visiplot	$259.95	now	$220.89
Visidex **Special**	$199.95	now	$139.00
Visiterm	$149.95	now	$127.39
Complete Mailing (Avant-Garde)	$59.95	now	$50.89
DB Master	$229.95	now	$194.59
PFS	$95.00	now	$80.69
PFS Report	$95.00	now	$80.69
Data Factory	$150.00	now	$124.00
Thinker	$495.00	now	$420.69
Request	$225.00	now	$191.19
Super Kram	$175.00	now	$148.69
ASCII Express	$99.95	now	$84.99
BPI Accounts Receivable	$395.00	now	$335.69
BPI General Ledger	$395.00	now	$335.69
The Mail Room	$29.95	now	$25.39
Continental General Ledger	$250.00	now	$212.49
Cont. Accounts Receivable	$250.00	now	$212.49
Cont. Accounts Payable	$250.00	now	$212.49
Continental Payroll	$250.00	now	$212.49
Broderbund Payroll	$395.00	now	$335.69
Informer II	$49.95	now	$42.49
Creative Financing	$150.00	now	$127.49
Real Estate Analyzer	$150.00	now	$127.49
Accounting Assistant (cass.)	$7.95	now	$6.89
Spell Star	$250.00	now	$212.49
Muse Form Letter	$100.00	now	$84.99
Property Management System	$225.00	now	$191.19

PERSONAL/HOME

Interlude (disk)	$19.95	now	$16.99
Handwriting Analysis	$19.95	now	$16.89
Decision Master	$29.95	now	$25.39
The Correspondent	$44.95	now	$38.19
Diet Planning	$24.95	now	$21.19
Win at the Races	$39.95	now	$33.89
Pro Football (SDL)	$26.95	now	$22.89
College Football (SDL)	$26.95	now	$22.89
Grocery List	$19.95	now	$16.89
Financial Management System II	$39.95	now	$33.89
Creativity Tool Box	$44.95	now	$38.19
Home Money Minder	$34.95	now	$29.69

HARDWARE

D.C. Hayes Micromodem	$375.00	now	$299.00
D.C. Hayes Smart Modem	$279.00	now	$249.00
MX-80 Printer/Cable/Card	$755.00	now	$575.00
MX-80 Replacement Head	$39.00	now	$34.99
MX-100FT with Graftrax	$995.00	now	$799.00
MX-80FT with Graftrax	$795.00	now	$649.00
460G Paper Tiger	$1094.00	now	$961.99
560G Paper Tiger	$1394.00	now	1225.00
Tiger Trax	$16.95	now	$15.25
Mark IV DOS Boot Switch	$24.95	now	$21.19
Z-80 Softcard	$395.00	now	$299.00
Expansion Chassis	$795.00	now	$675.00
Mt. Comp. Music System	$545.00	now	$479.00
NEC 12" Green on Black	$260.00	now	$209.00
Videx 80-col	$350.00	now	$299.00
Videx Switchplate	$19.95	now	$17.99
Andromeda 16K Ram Expansion	$199.00	now	$179.00
Microsoft 16K Ram Expansion	$199.00	now	$179.00
Keyboard Plus	$119.00	now	$99.99
TG Joystick	$59.95	now	$50.89
TG Game Paddles	$39.95	now	$33.89
Paymar LCA Rev. 7			$29.69

MISCELLANEOUS

Memorex Disks			10 for $24.99
Verbatim Datalife-plain w/hubs			10 for $27.99
Dysans			10 for $49.99
Flipsort Box			$29.80
Scotch Disk Cleaner	$29.95	now	$26.99
E-Z Port	$24.94	now	$21.19
Atari®/TRS-80®/Pet®			Write for Information

Call Toll-Free 800-344-4111 (Outside California)

HUNTINGTON COMPUTING
Post Office Box 1235
Corcoran, California 93212

Order by Phone 800-344-4111
In California (209) 992-5411

Apple® is a registered trademark of Apple Computer Inc.
Pet® is a registered trademark of Commodore
TRS-80® is a registered trademark of Tandy Corp.
Atari® is a registered trademark of Atari Inc.

VISA

master charge

We take MasterCard or VISA (Include card # and expiration date). California residents add 6% tax. Include $2.00 for postage. Foreign and hardware extra. Send for free catalog. Prices subject to change.

CIRCLE 144 ON READER SERVICE CARD

Lowest Prices on Personal Computers

800™.. $749
*Limited time only
ATARI® List $1080

ATARI® 400. $ 359
Atari 830 Acoustic Modern $159
Atari 825 80 Col. Impt. Ptr. $569
Atari 16K Ram Mem. Mod. $79
Atari 410 Prog. Recorder $69
Atari 810 Disk Drive $439

HEWLETT PACKARD
HP-85
$2495

NEW
HP-125
$3089
HP-83
$1600

HP-85 Accessories
5¼ Dual Master Disk Drive List $2500 ... $2025
5¼ Single Master Disk Drive List $1500 ... $1275
HP-85 Application pacs standard List $95 ... $85
Serial (RS232C) Interface Mod. List $395 ... $355
GP10 Interface Module List $495 .... $389

NEW!
HP-41CV with five times more memory built in.
List $325
$249

HP-41C
List $250
$189

HP-41CV Printer List $385 .... $289.00
HP-41CV Quad Mem. $83.95
HP-41CV CardReader $167.95
HP-12C $127.00
HP-11C $115.00
HP-33C $74.95
HP-34C $117.95

Personal Computer Systems
VISA
master charge
609 Butternut Street
Syracuse, N.Y. 13208
(800) 448-5259
In N.Y. call: (315) 475-6800
Prices do not include shipping by UPS. All prices and offers subject to change without notice

CIRCLE 157 ON READER SERVICE CARD

Discs in the Classroom, continued...

Post-Production

Producing a videodisc is done in three stages: preparing a premaster videotape, mastering a disc, and making replicates of the disc. Premastering is taking the assortment of source materials (slides, film, graphic art and videotape) and carefully editing them onto a one-inch helical videotape. Single slides must be recorded on single frames of tape, and all titles and captions must be added. Special encoding is required to allow access to individual videodisc frames. The preparation of this premaster tape is done by a post-production facility. We used the services of the Nebraska Videodisc Design/Production Group at the University of Nebraska.

> ***Videodisc production is not the expensive component in computer and videodisc courseware development.***

The premastered tape is then sent to a videodisc manufacturer. The process of making a videodisc is called mastering. The 3M Company in St. Paul, MN, facilitated the production of our master videodisc from the premastered tape. From this glass plate master, videodisc replications were made for use on the videodisc player.

Production Costs

Videodisc production costs (premastering and mastering) depend on the complexity and amount of material that is integrated into the disc. Our disc included slides, title frames, and two audio tracks as well as motion sequences. The cost for pre-mastering and mastering was $6,000. Replication of the master disc was inexpensive. In small quantities, copies can be made for fifteen to twenty dollars each.

Videodisc production is not the expensive component in computer and videodisc courseware development. The major expenses lie in the development of the courseware with its computer and video material.

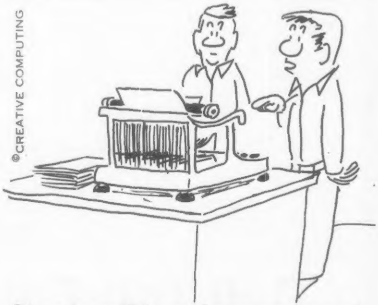
Videotape-based systems could, at times, be used to reduce the cost of using a videodisc system. In fact, we used a tape-based system as our development system. The setup is similar to the videodisc, but the videotape player replaces the videodisc equipment. However, the videodisc does have several advantages over the videotape, including lower cost hardware, clear single frame display, fast access time, reverse motion, and two separate audio channels, as well as durability. These features counter-balance the additional cost of videodisc production.

The Future

A two and one-half week economics unit has been developed for use with computers and videodisc technologies. This unit is one-fifth of a total, stand alone, self-instructional high school economics course. Initial reactions from students and teachers are favorable and suggest that the use of microcomputer and videodisc technology will play a significant role in the future of instruction. A more formal evaluation of this first economics unit is underway. Meanwhile, with support from the Minnesota State Department of Education, we are beginning to design and develop the second unit. As the units are completed, they will be made available for use in schools throughout the country.

We believe that our project will demonstrate the viability of these developing technologies. Most important, the project will demonstrate the feasibility of providing learning opportunities in circumstances where they do not now exist. We hope to be able to maintain and expand learning opportunities where they may be in the process of being phased out and, thereby, improve the comprehensiveness and quality of educational programs. This is especially important to the school district faced with a reduction in the course and program options available to the students.

Finally, we hope that the project will show how available, low-cost technology can be used to deliver information in an interesting and even exciting fashion. In addition to demonstrating the viability of the computer-videodisc concept, the project will generate important new information about the design and development tasks required when working with this type of instructional delivery system. ☐



It's an incredible word processor—no visible power source that I can find, complete user control over all functions, no internal ROM, RAM or other chips, no documentation or software. It could revolutionize the entire word-processing industry...

MOUNTAIN SOFTWARE

EXCITING DISCOUNTS

apple® SOFTWARE

SPECIAL: "THE BOOK"

OF APPLE COMPUTER SOFTWARE.

19.95 SALE 15.50

☐ Adventures #1, 2, 3	$39.95	NOW	$32.50
☐ Adventures #4, 5, 6	$39.95	NOW	$32.50
☐ Adventures #7, 8, 9	$39.95	NOW	$32.50
☐ Adventures #10, 11, 12	$39.95	NOW	$32.50
☐ Kid Venture	$23.95	NOW	$19.50
☐ Backgammon '43	$19.95	NOW	$16.50
☐ Pro Picks	$24.95	NOW	$19.50
☐ Stone of Sisyphus	$29.95	NOW	$24.50
☐ 16K Expansion Card	$195.00	NOW	$149.50
☐ Temple of Apshai	$39.95	NOW	$32.50
☐ Hellfire Warrior	$39.95	NOW	$32.50
☐ Star Warrior	$39.95	NOW	$29.50
☐ The Dragons Eye	$24.95	NOW	$20.50
☐ Apple Writer	$75.00	NOW	$67.50
☐ Crush, Crumble and Chomp	$29.95	NOW	$24.50
☐ Book of Apple Software	$19.95	NOW	$15.50
☐ Galactic Trader	$24.95	NOW	$19.50
☐ Apple Panic	$29.95	NOW	$24.50
☐ Alien Rain (Galaxian)	$24.95	NOW	$22.50
☐ Alien Typhoon	$24.95	NOW	$22.50
☐ Snoggle (Puckman)	$24.95	NOW	$22.50
☐ Space Warrior	$24.95	NOW	$20.50
☐ Raster Blaster	$29.95	NOW	$26.50
☐ HEAD ON	$24.95	NOW	$22.50
☐ World War III	$29.95	NOW	$25.50
☐ Bridge 2.0	$21.95	NOW	$19.50
☐ Ultima	$39.95	NOW	$34.50
☐ Home Money Minder	$34.95	NOW	$29.50
☐ 3-D Skiing	$24.95	NOW	$20.50
☐ House of Usher	$29.95	NOW	$25.50
☐ Sands of Mars	$29.95	NOW	$25.50
☐ Compu-Math Arithmetic	$49.95	NOW	$39.50
☐ Compu-Math Fractions	$39.95	NOW	$33.50
☐ Compu-Math Decimals	$39.95	NOW	$33.50
☐ Algebra 1	$39.95	NOW	$33.50
☐ Compu-Read 3.0	$29.95	NOW	$25.50
☐ Spelling Bee	$29.95	NOW	$25.50
☐ The Prisoner	$29.95	NOW	$25.50
☐ Compu-Spell/Req Data Disk	$29.95	NOW	$25.50
☐ Data Disk Level 4	$19.95	NOW	$16.50
☐ Data Disk Level 5	$19.95	NOW	$16.50
☐ Data Disk Level 6	$19.95	NOW	$16.50
☐ Data Disk Level 7	$19.95	NOW	$16.50
☐ Data Disk Level 8	$19.95	NOW	$16.50
☐ Data Disk Secretarial	$19.95	NOW	$16.50
☐ Windfall	$19.95	NOW	$16.50
☐ Network	$19.95	NOW	$16.50
☐ Sargon II (chess)	$34.95	NOW	$29.50
☐ Pool 1.5	$34.95	NOW	$29.50
☐ Reversal (othello)	$34.95	NOW	$29.50
☐ Shuffle Board	$34.95	NOW	$29.50
☐ Spellguard for Apple	$295.00	NOW	$245.50
☐ Sup 'R' Terminal 80 Col	$375.00	NOW	$309.50
☐ Memorex 3401 Box of 10	$45.00	NOW	$24.50
☐ Word Star	$375.00	NOW	$275.50
☐ Super Sort	$200.00	NOW	$155.50
☐ Mail Merger	$125.00	NOW	$99.50
☐ Typing Tutor	$19.95	NOW	$17.50
☐ Z-80 Softcard With CP/M	$399.00	NOW	$299.50
☐ CPS Multifunction Card	$239.00	NOW	$189.50
☐ Super Text II	$150.00	NOW	$134.50
☐ A.B.M.	$24.95	NOW	$22.50
☐ Castle Wolfenstein	$29.95	NOW	$25.50
☐ Mission Asteroids	$19.95	NOW	$17.50
☐ Mystery House	$24.49	NOW	$21.50
☐ Wizard and the Princess	$32.95	NOW	$29.50
☐ Cranston Manor	$34.95	NOW	$29.50
☐ Pegasus II	$29.95	NOW	$25.50
☐ Superscribe	$89.95	NOW	$79.50
☐ Superscribe (New)	$129.95	NOW	$109.50
☐ Hi-Res Football	$39.95	NOW	$34.50
☐ Hi-Res Soccer	$29.95	NOW	$25.50
☐ Soft Porn Adventure	$29.95	NOW	$25.50
☐ Threshold	$39.95	NOW	$35.50
☐ Gobblers	$24.95	NOW	$19.50
☐ Magic Wand 80 Column	$395.00	NOW	$289.50
☐ Falcons	$29.95	NOW	$25.50
☐ Fastgammon	$24.95	NOW	$20.50
☐ International Grand Prix	$29.95	NOW	$25.50

FREE OFFER

WITH PURCHASE OF ANY 3 PROGRAMS, YOU WILL RECEIVE FREE THE ORIGINAL ADVENTURE GAME, CONVERTED TO LOAD ENTIRELY INTO 48K RAM ON APPLE. NOTHING LEFT OUT, AMAZING!

☐ Sanyo 9" B/W Monitor	$235.00	NOW	$189.50
☐ Space Eggs	$29.95	NOW	$24.50
☐ Orbitron	$29.95	NOW	$24.50
☐ Gamma Goblins	$29.95	NOW	$24.50
☐ Gorgon	$39.95	NOW	$33.50
☐ Epoch	$34.95	NOW	$28.50
☐ Outpost	$29.95	NOW	$24.50
☐ Pulsar II	$29.95	NOW	$24.50
☐ Autobahn	$29.95	NOW	$24.50
☐ Sneakers	$29.95	NOW	$24.50
☐ Cops and Robbers	$34.95	NOW	$28.50
☐ Galactic Attack	$29.95	NOW	$25.50
☐ Starmines	$29.95	NOW	$24.50
☐ Apple 21 (Blackjack)	$24.95	NOW	$19.50
☐ Craps	$24.95	NOW	$19.50
☐ Magic Window Word Proc	$99.95	NOW	$84.50
☐ Magic Mailer	$69.95	NOW	$57.50
☐ Personal Filing System	$95.00	NOW	$83.50
☐ Personal Report System	$95.00	NOW	$83.50
☐ IFO Database Manager	$120.00	NOW	$99.50
☐ Inventory System 3.3	$140.00	NOW	$119.50
☐ Prof. Time and Billing	$325.00	NOW	$259.50
☐ Microgammon	$29.95	NOW	$24.50
☐ Draw Poker	$29.95	NOW	$24.50
☐ Roulette	$24.95	NOW	$19.50
☐ Payroll System	$240.00	NOW	$205.50
☐ Apartment Manager	$325.00	NOW	$259.50
☐ Coloring Board Programs	$69.95	NOW	$59.50
☐ D-B Master	$229.00	NOW	$189.50
☐ The Warp Factor	$39.95	NOW	$33.50
☐ Flight Simulator	$33.50	NOW	$29.50
☐ Saturn Navigator (req 3d)	$24.95	NOW	$22.50
☐ The Shattered Aliance	$59.95	NOW	$49.50
☐ A2-3D Graphics Pkg	$59.95	NOW	$45.50
☐ Odyssey	$30.00	NOW	$19.50
☐ Wilderness Campaign	$20.00	NOW	$15.50
☐ Wilderness and Dungeon	$32.00	NOW	$22.50
☐ Modifiable Database	$79.50	NOW	$59.50
☐ Program Line Editor	$40.00	NOW	$29.50
☐ Higher Text II	$35.00	NOW	$25.50
☐ Linguist	$40.00	NOW	$28.50
☐ Mailing List Database	$50.00	NOW	$35.50
☐ Pro Football Pt. Pred	$26.95	NOW	$22.50
☐ College Football Pt. Pred	$26.95	NOW	$22.50
☐ Win At The Races	$39.95	NOW	$34.50
☐ Space Raiders	$29.95	NOW	$25.50
☐ Videoterm 80 Col Card	$345.00	NOW	$279.50
☐ Keybd and Disp Enhancer	$129.00	NOW	$109.50
☐ The Forcaster II	$26.95	NOW	$22.50
☐ Multiple Regression	$29.95	NOW	$25.50
☐ Lower Case Chip	$49.95	NOW	$45.50
☐ Microchess 2.0	$24.95	NOW	$22.50
☐ Zork	$39.95	NOW	$33.50
☐ Visicalc 3.3	$199.95	NOW	$169.50
☐ Visiterm	$149.95	NOW	$125.50
☐ Visiplot	$179.95	NOW	$149.50
☐ Visitrend/Visiplot	$259.95	NOW	$215.50
☐ Gammon Gambler	$24.95	NOW	$22.50
☐ CCA Data Management Sys.	$99.95	NOW	$84.50

DEDUCT 3% IF PAYMENT ACCOMPANIES ORDER. WE PAY SHIPPING AND IF YOU PHONE YOUR ORDER WE WILL CREDIT $1.00 FOR CALL. CALIFORNIA RESIDENTS ADD 6% SALES TAX. ALL ORDERS SHIPPED FROM STOCK WITHIN 48 HOURS. WE ACCEPT MASTER CARD AND VISA. C.O.D'S ADD $5.00

NAME ....

STREET ....

CITY .... STATE .... ZIP ....

CARD # ....

EXP. DATE .... SIGNATURE.......................

★518 E. ECHO CT., SAN BERNARDINO, CA 92404

PHONE ORDERS (714) 886-0761

CIRCLE 310 ON READER SERVICE CARD

Using a Videodisc with Apple SuperPilot

V is for Videodisc

Charlie Kellner

Charlie Kellner works for Apple Computer, Inc. and was one of the developers of Apple Pilot and SuperPilot. Here he gives a brief introduction to the capabilities of SuperPilot as they relate to videodisc technology to whet our appetites. An in- depth evaluation of SuperPilot is planned for an upcoming issue.

Q: What talks to a videodisc, has 27 colors, and flies?
A: Apple SuperPilot!

Hi. Welcome to the future. I'm Charlie Kellner, and I'll be your guide for a brief tour of Apple's remarkable new educational system, called SuperPilot.

Let's start with a quick review. Pilot is an instructional language similar to Basic. The letters stand for "Programmed Inquiry for Learning Or Teaching." Apple Pilot is an extended version of Pilot for the Apple II, with built-in graphics, high-resolution character sets, and sound effects.

When Apple Pilot appeared a year and a half ago, it answered many questions. It also raised many new ones. The most frequently asked was, "How can I control a videodisc player with Pilot?" The answer is SuperPilot.

What is SuperPilot?

Technically speaking, SuperPilot is a "superset" of Apple Pilot. In other words, any lesson that will run in Apple Pilot will also run in SuperPilot.

Apple SuperPilot has many additional commands and features which have been specially designed to enhance the educational process. The actual design of the SuperPilot system is a direct result of the tremendous response Apple received from Pilot authors across the nation. In fact, most of its new capabilities were originally suggested by Apple Pilot users.

Mixed high-resolution text and graphics are standard in both Apple Pilot and SuperPilot; however, SuperPilot can print the text in 27 colors, on 27 colors of background, in single or double size fonts. It can also animate blocks of custom-drawn characters (remember "Maxwell"?) at up to thirty frames per second. It can control a printer, keep student records, and generally do most anything in order of magnitude faster than Apple Pilot. Like the man said, "Try it—you'll believe a program can fly!" But seriously, folks...

> **Just imagine, though, having a child's favorite cartoon characters tell him why 2 and 2 doesn't equal 22.**

The V: Command

Perhaps the single most powerful new command is V:. With this command, you can add materials from videodisc or videotape sources to any SuperPilot lesson. For instance, it's obvious that a practical demonstration of life-saving techniques is much more effective than a lengthy discussion. Just imagine, though, having a child's favorite cartoon characters tell him why 2 and 2 doesn't equal 22. The possibilities are endless.

With a random-access videodisc player, for example, you might start out with the SuperPilot command "V:INIT." To display a picture located on frame 25037, you could say: "V:FIND(25037);VIDEO." To play an entire movie from frame 1200 to frame 15000, the command would be "V:PLAY(1200,15000)," and so on. The actual command words may vary slightly from one videodisc or videotape machine to another, but the functions will be essentially the same.

The first thing you need in order to use this capability (besides an Apple II) is a video source. Most modern disc and tape players have remote control capability; in fact, an increasing number of them are designed for computer control. The Apple (like most personal computers) usually requires a special interface card to control the player. What kind of card you need to use depends on which unit you want to control, so before you invest in video equipment, be sure that a suitable interface is available!

The other thing you need is a special control program to allow SuperPilot to talk to the hardware. This will very likely be available from the same people who supplied you with the interface card. If you have a Pascal language system, on the other hand, you can write your own!

How Does SuperPilot Control the Videodisc?

The SuperPilot system is written in Apple Pascal 1.1 (a structured programming language for the Apple II). Each lesson disk-

Charlie Kellner, Apple Computer, Inc., 10260 Bandley Dr., Cupertino, CA 95014.

ette contains a library of Pascal subroutines which are used by the SuperPilot interpreter as it runs your lessons. Library unit 8, named "VCONTROL," contains just one procedure, called "VCOMMAND." As you might suspect, this is the procedure which controls the videodisc. Whenever a V: command is executed, SuperPilot calls this procedure, and simply does whatever it tells it to.

A complete description of how to write a VCONTROL subroutine is beyond the scope of this article. Suffice it to say that you can use any combination of Pascal and 6502 assembly language, up to 1K total (just remember, a picture is worth 1,024 words). All the information you need is supplied with the system.

Why Use a Videodisc?

Videodisc technology brings tremendous new capabilites to the classroom. It is no exaggeration to say that a single videodisc contains more information than any computer program ever written. In terms of storage alone, each side of the disc can hold up to 54,000 frames, with both pictures and stereo sound. In computer terms, that's more than three billion bits of data!

> ***A videodisc player is much more than just a high-technology slide projector.***

A videodisc player is much more than just a high-technology slide projector, though. Not only can any single frame be displayed at random, but any sequence of frames can be shown, either forwards or backwards, at any speed up to 30 frames a second. It can find any individual frame in just a few seconds and hold it all day without any loss of picture quality.

Still, the most exciting thing about the videodisc is not what it does, but what you can do with it. Under computer control, each and every one of those 54,000 frames becomes a resource in a portable "library" of visual materials. It's not inconceivable that one side of a single disc, properly organized, could hold an entire curriculum's worth of reference material, which could be used interactively by a wide variety of instructional programs.

By itself, the videodisc will have an unprecedented effect on the educational system. Used in conjunction with the personal computer, its potential is limited only by the imagination. ☐

do you have a hard time tearing yourself away...

... from endless tax tables and computations every time you run your payroll?

Consider the fast and versatile alternative. PAYROLL from Brøderbund Software is written in PASCAL and assembly language so it runs many times faster than Basic, yet it requires no language card or other special hardware! PAYROLL will run on any 48K Apple II with DOS 3.3 and two disk drives.

Look at these other powerful features!

- COMPUTES all Federal and State Income Taxes, plus other state and local taxes for any and all 50 states and Washington D.C. Tax formulas are built in, no messy entry from tax tables required.
- CAPACITY of 300 employees, 15 Divisions/Stores in multiple states . . . any state. Up to 30 additional user defined deduction types.
- PRINTS payroll checks, check register, W-2 forms, all summary and quarterly reports, ethnic distribution, employee lists, and file usage information . . . all in the time it takes your printer to print!
- FULL SUPPORT after you make your purchase. Hotline for technical assistance. Payroll tax update service to keep your system current, even with changes in local laws, available at low cost (free for the first year). Your system never becomes obsolete!

Ask for a demonstration of the Brøderbund PAYROLL at your authorized Apple dealer.
Coming soon . . . PASCAL General Ledger
Accounts Receivable
Accounts Payable
For hard disk users — PAYROLL "HD" has a capacity of 745 employees and 63 Divisions, plus other special features, and requires a Pascal language card system.
Apple II is a trademark of Apple Computer Company.

Brøderbund Software 2 Vista Wood Way San Rafeal, CA 94901 (415)456-6424

CIRCLE 129 ON READER SERVICE CARD

ALL ATARI® HARDWARE
15%-25%
OFF LIST PRICE
ATARI

	OUR PRICE	SAVE
Atari 400 w/16K	$320	20%
Atari 800 w/16K	$810	25%
Atari 410 cassette	$ 67	25%
Atari 810 disk drive	$480	20%

ALL ATARI® ACCESSORIES
10%-20% OFF LIST PRICE

8K Memory Board	$45	10%
16K Memory Board	$80	20%
Joysticks (pair)	$17	15%
Paddles (pair)	$17	15%

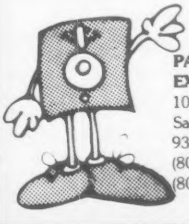
PLUS 10%-20% OFF ALL ATARI® SOFTWARE
ALSO 3RD PARTY HARDWARE AND SOFTWARE AT COMPARABLE SAVINGS
To order Call 617-964-3080
Ask for mail order, or write
The Bit Bucket
1355 Washington Street (Rt. 16)
West Newton, MA 02165 617-964-3080

CIRCLE 115 ON READER SERVICE CARD

MEMOREX
FLEXIBLE DISCS

WE WILL NOT BE UNDERSOLD!! Call Free **(800)235-4137** for prices and information. Dealer inquiries invited and C.O.D.'s accepted.

VISA



PACIFIC EXCHANGES
100 Foothill Blvd.
San Luis Obispo, CA 93401. In Cal. call (800)592-5935 or (805)543-1037

CIRCLE 169 ON READER SERVICE CARD

The First National Kidisc—
TV Becomes a Plaything

Now you don't have to worry about letting your children watch the tube. This interactive videodisc can provide hours of educational fun.

John Blizek

THE FIRST TIME you work with the LaserVision videodisc player, you will probably discover, as we did, that it is a communication tool with truly exciting potential. We also found, however, that the software that was available was not designed to exploit this potential. We saw a glaring need for an approach to programming that made use of the interactivity possible between the viewer and the program.

Our feeling was that children would be particularly responsive to an interactive disc. This belief was confirmed by a young nephew of Lin Oliver, one of our clients at MCA Videodisc. The young boy sought out from the DiscoVision library feature films with numerous car crashes, explosions, and the like. By stepframing, slowing, freezing, and reversing these scenes, he was creating an interactive situation from the only material that was available to him.

Our production team consisted of producer Bruce Seth Green, co-producers James Ritter and myself, director of photography H. J. Brown art director Betty Green, and educational consultant Ann Brown. We submitted our proposal, in treatment form, to Optical Programming Associates, which is responsible for creating programming designed specifically to make maximum use of the features of the LaserVision system.

Since our show would be the first of its kind, we had to establish our own set of rules. What came of our many early brainstorming sessions would be revised and expanded and eventually would become the first truly interactive disc program for the home user—*The First National Kidisc.*

IN DESIGNING our program, we had four basic requirements:

1. It had to utilize *all* of the optical videodisc functions—forward and reverse modes, slow motion, stepframe still-frame, dual audio channels, and chapter stops.
2. It had to play as a cohesive program, even though it would contain nearly 30 individual modules.
3. It had to be an entertaining and "human" program rather than a cold, sophisticated information storage system.
4. The sequences had to have a high repeatability value. We felt one or two viewings should *not* be sufficient to exhaust the information available in a particular sequence.

Our first outline was called *18 Things To Do On A Rainy Day,* and consisted mostly of craft activities. Although these did utilize the various disc functions, we realized that, with a few exceptions, the show would work equally well on linear videotape. Expanding our ideas further, we developed our first "breakthrough" segment—*101 Jokes and Riddles.*

This segment was oriented exclusively to the LaserVision videodisc. With a question on one frame and an answer on the following frame, we found that we could present 101 pairs of riddles in less than nine seconds of actual disc time, yet to read all 101 in the step-frame mode could take nearly half an hour. What we did, in effect, was encode information by compressing it. Incomprehensible at the normal speed of 24 fps, it could be decoded or expanded by using the step-frame viewing mode.

The encyclopedia concept of single-frame events led to three other segments—visual puzzles, a flag identification game, and a dinosaur name game. In single frames, following real-time demonstrations on how to make a secret decoder and a waterglass xylophone, we presented 13 messages to decode and the music for ten songs, respectively. In both cases, one-half second of screen time could be expanded into hours of play value.

We then extended single-framing from animation into the realm of live-action photography. The first segment of this type was *A Trip to the Zoo.* By single-framing a 16mm motion picture camera, we created a sequence lasting less than a minute that contained over 40 animals, each preceded by an identification sign. By using the step- and still-frame modes, a child can view a slide show with five to ten views of each animal. Then we suggest to the child that he view the sequences in reverse and make a game out of guessing each animal before he gets back to the identification sign.

We then began to experiment with vicarious travel. We took our cameras on an airplane ride over Catalina Island and parts of Santa Monica. We found that the feeling of flight worked best when the camera angle was straight ahead. Pointing

---

John Blizek is a video and film producer and a member of B. Green Co. He was co-producer and Editor of the Kidisc, the first videodisc especially for children, which is the subject of this article. B. Green Co. retains copyright on this discussion and it is used here with permission. The company also retains rights to the photographs, which are also used with permission.

Does your **CP/M**** or **TRS-80*** Word Processor need help?

Aspen Software has the finest document proofreading tools available.

GRAMMATIK™

Beyond Spelling Checking

Spelling checkers are useful, but they are not enough! Grammatik can find many errors that a spelling checker can't. It detects many errors commonly found in text entered on computers, such as doubled words ("the the"), inconsistent capitalization ("STicky shift key"), incorrect punctuation, and others. That's not all! Grammatik also checks your document for good writing style using a dictionary of over 500 misused phrases as defined in many writer's style manuals. It marks and classifies the problems it finds in the document file for easy correction with your word processor, and provides suggestions for correcting the problems. The phrase dictionary can be easily extended to include checking for esoteric jargon or your own pet peeves. Grammatik also collects other stylistic information that can be used to revise the document to improve its readability such as average sentence and word length. It can produce a profile with the number of times each unique word in the document was used, helpful for identifying overworked vocabulary. Grammatik is not only a valuable proofreading tool, it is also a useful learning tool. You will notice significant improvements in your own writing style after using Grammatik for only a short time. Grammatik is fast, easy to use, and works with all popular TRS-80 and CP/M word processors. Model I/III version requires a minimum 32K, 1 drive system. Model II TRSDOS* version requires 64K and 1 drive. CP/M version requires CP/M release 2.2 and 48K.

PROOFREADER™

The Aspen Software Company Spelling Checker

Don't buy a spelling checker until you've considered Proofreader. Recently, several ads for other spelling checkers have compared themselves to "others". They weren't comparing themselves to Proofreader! Proofreader has all the features you need for checking your documents for spelling errors and typos. Proofreader looks up every word in its 38,000 word dictionary, and does not increase its "vocabulary" by using less accurate root word analysis like some others do. You won't need to spend as much time adding new words as you would with a smaller dictionary. Proofreader is easy to use -- you can start checking your documents immediately. Proofreader is fast -- it can check even your largest document (20 pages or more) in less than 5 minutes! Unknown words are listed on the screen, and can be saved in a file for later manipulation. The Proof-Edit feature (optional on the Model I/III version, included with Model II and CP/M) allows you to interactively correct the unknown words in context. New words can easily be added to the dictionary, and expansion is limited only by disk capacity. Proofreader works with all TRS-80 operating systems and word processors, so if you change systems, you won't need a new spelling checker. On the TRS-80 Model I/III, only 32K RAM and 1 disk drive are needed. Proofreader also works with all popular CP/M word processors. Add up the facts and the low price, and you will conclude that Proofreader is the best value available in spelling checkers.

Aspen Software programs are professional quality, reliable software tools developed for the TRS-80 and CP/M by a Ph.D. in Computer Science. All software is protected by Aspen Software's low cost upgrade privilege for new versions. Other tools include:

— SOFT-SCREEN™, a powerful, state of the art full screen text editor. Over a year in development, Soft-Screen is compatible with all TRS-80 programming languages, including BASIC, FORTRAN, MACRO, Ratfor, and COBOL. Commands are easy to learn, yet versatile and complete to satisfy the most experienced user. Soft-Screen is also available for P&T Model II CP/M.

— SOFT-TEXT™, Aspen Software's text formatter. When used with Soft-Screen, provides a powerful word processing system. Full featured, including automatic pagination, even and odd page headings, underlining, index generation, footnotes, support for advanced printer capabilities, and much more. Model I/III version supports serial printers at full speed. Soft-Text offers a real alternative for Model II TRSDOS users. Please write or call for more details.

— RATFOR, a structured language preprocessor for Fortran developed at Bell Labs. Aspen Software Ratfor is one of the best versions available, and the only one with a pretty printer option. Totally compatible with Microsoft F80. Includes several extensions, including "case", "string", and conditional compilation. User's manual contains all information needed to learn and write Ratfor programs. Requires FORTRAN.

— PP-RATFOR, a pretty printer. Automatically formats and indents Aspen Software Ratfor source programs. An essential program development tool.

	Model I	Model II (64k,1d)	Model III	CP/M (2.2,48k)	Manual only
Proofreader	$54.00(32k1d)	$119.00	$64.00(32k1d)	$129.00	$8.00
Proof-Edit	$30.00	incl.	$30.00	incl.	incl.
Grammatik	$59.00(32k1d)	$99.00	$59.00(32k1d)	$149.00	$8.00
Soft-Screen	$69.00(48k1d)	$99.00	$75.00(48k1d)	$99.00(P&T)	$15.00
Soft-Text	$69.00(48k1d)	$99.00	$75.00(48k1d)	$99.00	$15.00
both	$129.00	$179.00	$139.00	$179.00	$25.00
Ratfor	$49.00(48k2d)	$99.00	$59.00(48k1d)	$99.00	
PP-Ratfor	$30.00(48k2d)	$49.00	$34.00	$49.00	
both	$74.00(48k2d)	$139.00	$84.00	$139.00	$15.00

IMPORTANT: Specify computer model, operating system, memory size, and number of drives when ordering! For CP/M, currently only 8" single density CP/M versions available. Please inquire about other CP/M disk formats. All TRS-80 versions available. Manual only orders can be applied to final purchase. CP/M prices are introductory.

Orders sent postpaid by first class mail. Terms: Cash, check, money order, VISA, or Master Card. NM residents add 4% tax.

Proofreader, Grammatik, Soft-Screen, and Soft-Text are trademarks of Aspen Software.

**trademark of Digital Research *trademark of Tandy Corp.

VISA MasterCard

ASPEN SOFTWARE COMPANY™

P.O. Box 339-C Tijeras, NM 87059 (505) 281-1634

CIRCLE 116 ON READER SERVICE CARD

Table of Contents for The First National Kidisc

1. Disc opening and main title montage, description of videodisc features
2. Paper flying machines
3. The flag game
4. Sign language
5. Terry teaches the jig
6. Movie magic flip book
7. Flying
8. The Kidisc target game
9. Knot tying
10. Manfred presents: Three Card Monty
11. The Kidisc trip to the zoo
12. Cat's cradle
13. 101 jokes and riddles
14. The water glass xylophone
15. Pig Latin
16. The dinosaur name game
17. Manfred presents: The performing paper clips
18. The Origami crane
19. Terry teaches rock dancing
20. A trip to Universal Studios tour
21. Secret code maker
22. The Kidisc bar game
23. Manfred presents: The amazing rope trick
24. Puzzlers
25. Athletes in motion
26. Closing and end credits

it straight down, however, was interesting in the step- and still-frame modes since each frame was significently different and the terrain and structures formed constantly changing patterns. At roughly one frame per second, the entire flight—from takeoff to landing—took one minute.

Another vicarious trip was a tour of Universal Studios. Depending on the particular attraction, either separate, unrelated frames, or sequences of time-related frames were clicked off at varying rates.

We then added *Athletes in Motion*, in which a child can study the movement of the human body. The child now has control of the slow motion and freeze-framing that previously were the domain of the television sports director.

At this point, we modified two segments to take advantage of the disc's information compression potential. A demonstration of how to fold an Origami crane originally took three minutes in real time, no matter how ruthlessly we cut it. We then shot the demonstration at 8 fps, cutting the time by one-third, yet still retaining all of the necessary information. Since the machine's slow motion mode is infinitely variable, the viewer can easily restore the sequence to "real time."

In *Paper Flying Machines*, we pushed paper-folding to its compressible limit. A frame was clicked off only when it was absolutely essential to a clear demonstration of the folding process. Our original real-time version took two and one-half minutes to show the folding of three airplanes. In one minute, shooting only the essential frames, the revised version included 12 paper airplanes.

We also created two video games based on the optical videodisc's ability to stop instantly and hold a clear, frozen frame. In one case, to make the highest score the viewer is asked to freeze the picture when the moving concentric circles of a target reach the bull's eye. The second game utilizes two rectangles that move quickly across a colorful field of vertical bars. Freezing the disc when the rectangles occupy the same bar scores the highest number of points. In both games, negative points penalize the player for overshooting the target. (The games can be made easier by playing the disc in slow motion.)

We used the disc's two-channel audio capability in a section demonstrating *Pig Latin*. On one channel, a girl gives an on-camera explanation of how to speak Pig Latin—in Pig Latin. The other channel carries a voice-over translation. In another case, we teach two dances with music and instruction on one channel and music alone on the second. Once children have learned the dance, they can turn off the instruction channel and dance to the music and picture only.

To achieve our goal of a cohesive blending of segments and an entertaining "human" presentation, we employed several devices. First, we introduced two principal characters—a magician and a dance instructor—who appear in various segments. Second, a spinning videodisc in black limbo appears between segments as a consistent bridging device. Third, each segment is preceded by a title sequence, and last, music cues segue' throughout.

THE FOLLOWING POINTS have come from our production experience with *The First National Kidisc* and may benefit your interactive video production.

1. Compressing information can be a useful technique. When appropriate, utilize the encyclopedia concept of single-frame events, especially when a lot of graphic information must be presented. Live-action photography can be compressed by filming at speeds less than 24 fps. This is particularly appropriate for demonstrations or processes. Determine how much visual information is essential to the viewer, presented as single frames, to arrive at your shooting speed.

Working on one of the animation segments for The First National Kidisc *are (from left to right) James Ritter, Betty Green, and Bruce Green. Nearly one-third of the disc is composed of animated segments.*

OSI TRS-80 COLOR-80 OSI

GALAXIAN - 4K - One of the fastest and finest arcade games ever written for the OSI, this one features rows of hard-hitting evasive dogfighting aliens thirsty for your blood. For those who loved (and tired of) Alien Invaders. Specify system — A bargain at $9.95 OSI

LABYRINTH - 8K - This has a display background similar to MINOS as the action takes place in a realistic maze seen from ground level. This is, however, a real time monster hunt as you track down and shoot mobile monsters on foot. Checking out and testing this one was the most fun I've had in years! — $13.95. OSI

THE AARDVARK JOURNAL

FOR OSI USERS — This is a bi-monthly tutorial journal running only articles about OSI systems. Every issue contains programs customized for OSI, tutorials on how to use and modify the system, and reviews of OSI related products. In the last two years we have run articles like these!

1) A tutorial on Machine Code for BASIC programmers.
2) Complete listings of two word processors for BASIC IN ROM machines.
3) Moving the Directory off track 12.
4) Listings for 20 game programs for the OSI.
5) How to write high speed BASIC — and lots more —

Vol. 1 (1980) 6 back issues - $9.00

Vol. 2 (1981) 4 back issues and subscription for 2 additional issues - $9.00.

ADVENTURES!!!

For OSI, TRS-80, and COLOR-80. These Adventures are written in BASIC, are full featured, fast action, full plotted adventures that take 30-50 hours to play. (Adventures are interactive fantasies. It's like reading a book except that you are the main character as you give the computer commands like "Look in the Coffin" and "Light the torch".)

Adventures require 8K on an OSI and 16K on COLOR-80 and TRS-80. They sell for $14.95 each.

ESCAPE FROM MARS (by Rodger Olsen)

This ADVENTURE takes place on the RED PLANT. You'll have to explore a Martian city and deal with possibly hostile aliens to survive this one. A good first adventure.

PYRAMID (by Rodger Olsen)

This is our most challenging ADVENTURE. It is a treasure hunt in a pyramid full of problems. Exciting and tough!

TREK ADVENTURE (by Bob Retelle)

This one takes place aboard a familiar starship. The crew has left for good reasons - but they forgot to take you, and now you are in deep trouble.

DEATH SHIP (by Rodger Olsen)

Our first and original ADVENTURE, this one takes place aboard a cruise ship - but it ain't the Love Boat.

VAMPIRE CASTLE (by Mike Bassman)

This is a contest between you and old Drac - and it's getting a little dark outside. $14.95 each.

OSI NEW-NEW-NEW OSI
TINY COMPILER

The easy way to speed in your programs. The tiny compiler lets you write and debug your program in Basic and then automatically compiles a Machine Code version that runs from 50-150 times faster. The tiny compiler generates relocatable, native, transportable machine code that can be run on any 6502 system.

It does have some limitations. It is memory hungry — 8K is the minimum sized system that can run the Compiler. It also handles only a limited subset of Basic — about 20 keywords including FOR, NEXT, IF THEN, GOSUB, GOTO, RETURN, END, STOP, USR(X), PEEK, POKE, -, =, *, /, , <,> , Variable names A-Z, and Integer Numbers from 0-64K.

TINY COMPILER is written in Basic. It can be modified and augmented by the user. It comes with a 20 page manual.

TINY COMPILER — $19.95 on tape or disk OSI

SUPERDISK II

This disk contains a new BEXEC* that boots up with a numbered directory and which allows creation, deletion and renaming of files without calling other programs. It also contains a slight modification to BASIC to allow 14 character file names.

The disk contains a disk manager that contains a disk packer, a hex/dec calculator and several other utilities.

It also has a full screen editor (in machine code on C2P/C4)) that makes corrections a snap. We'll also toss in renumbering and program search programs — and sell the whole thing for —

SUPERDISK II $29.95 (5¼") OSI

BARE BOARDS FOR OSI C1P

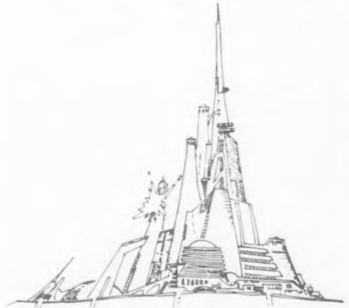
MEMORY BOARDS!!! — for the C1P — and they contain parallel ports!

Aardvarks new memory board supports 8K of 2114's and has provision for a PIA to give a parallel ports! It sells as a bare board for $29.95. When assembled, the board plugs into the expansion connector on the 600 board. Available now!

PROM BURNER FOR THE C1P — Burns single supply 2716's. Bare board — $24.95.

MOTHER BOARD — Expand your expansion connector from one to five connectors or use it to adapt our C1P boards to your C4/8P. - $14.95.

16K RAM BOARD FOR C1P — This one does not have a parallel port, but it does support 16K of 2114's. Bare Board $39.95.



WORD PROCESSING THE EASY WAY— WITH MAXI-PROS

This is a line-oriented word processor designed for the office that doesn't want to send every new girl out for training in how to type a letter.

It has automatic right and left margin justification and lets you vary the width and margins during printing. It has automatic pagination and automatic page numbering. It will print any text single, double or triple spaced and has text centering commands. It will make any number of multiple copies or chain files together to print an entire disk of data at one time.

MAXI-PROS has both global and line edit capability and the polled keyboard versions contain a corrected keyboard routine that make the OSI keyboard decode as a standard typewriter keyboard.

MAXI-PROS also has sophisticated file capabibilities. It can access a file for names and addresses, stop for inputs, and print form letters. It has file merging capabilities so that it can store and combine paragraphs and pages in any order.

Best of all, it is in BASIC (0S65D 51/4" or 8" disk) so that it can be easily adapted to any printer or printing job and so that it can be sold for a measly price.

MAXI-PROS — $39.95. Specify 5¼ or 8" disk.

SUPPORT ROMS FOR BASIC IN ROM MACHINES — C1S/C2S. This ROM adds line edit functions, software selectable scroll windows, bell support, choice of OSI or standard keyboard routines, two callable screen clears, and software support for 32-64 characters per line video. Has one character command to switch model 2 C1P from 24 to 48 character line. When installed in C2 or C4 (C2S) requires installation of additional chip. C1P requires only a jumper change. — $39.95

C1E/C2E similar to above but with extended machine code monitor. — $59.95 OSI

ARCADE GAMES FOR OSI, COLOR-80 AND TRS-80 (8K OSI, 16K TRS-80 AND COLOR-80)

TIMETREK - A REAL TIME, REAL GRAPHICS STARTRECK. See your torpedoes hit and watch your instruments work in real time. No more unrealistic scrolling displays! $14.95.

STARFIGHTER - This one man space war game pits you against spacecruisers, battlewagons, and one man fighters, you have the view from your cockpit window, a real time working instrument panel, and your wits. Another real time goody. $9.95

BATTLEFLEET - This grown up version of Battleship is the toughest thinking game available on OSI or 80 computers. There is no luck involved as you seek out the computers hidden fleet. A topographical toughie. $9.95

QUEST - A NEW IDEA IN ADVENTURE GAMES! Different from all the others, Quest is played on a computer generated mape of Alesia. Your job is to gather men and supplies by combbat, bargaining, exploration of ruins and temples and outright banditry. When your force is strong enough, you attack the Citadel of Moorlock in a life or death battle to the finish. Playable in 2 to 5 hours, this one is different every time.

16K COLOR-80 OR TRS-80 ONLY. $14.95

Please specify system on all orders

This is only a partial listing of what we have to offer. We offer over 120 games, ROMS, and data sheets for OSI systems and many games and utilities for COLOR-80 and TRS-80. Send $1.00 for our catalog.

AARDVARK TECHNICAL SERVICES, LTD.
2352 S. Commerce, Walled Lake, MI 48088
(313) 669-3110

CIRCLE 102 ON READER SERVICE CARD

OSI COLOR-80

Pictured above is Jenny Brown following a paper-folding demonstration from the film-editing bench which allows for frame-by-frame access so Jenny can move along at her own speed.

2. The slow shutter speed of motion picture cameras is a problem when you want sharp, single frames and the camera or subject is in motion. Variable shutter cameras can solve this problem.

3. The audio signals cut off when the LaserVision disc is played at speeds other than normal play. Therefore audio information can be related to compressed time segments only when played at normal speed.

4. The audio quality of a LaserVision videodisc is *very* good. Take care in original recording, transfers, and re-recording. If your program is on film, use your mixed mag track when transferring to disc.

5. To avoid losing frames, single-frame sequences *must* be shot on film. They can then be transferred to videotape if you so desire. (That has some advantages, as discussed below.)

6. Assembling A and B rolls on videotape is very time-consuming and costly, and is likely to result in lost frames. The last point is significant only when edits occur within, at the beginning, or at the end of single-frame sequences. It is advisable at least to go to an answer print before transferring to videotape so video editing is eliminated. Conformed 35mm camera original *can* be transferred directly to tape since A and B rolls need not be made.

7. Timing and color correction can be a problem in compressed time sequences when you are dealing with very short shots. Forty frames is about the minimum reaction time for laboratory timing corrections. Therefore color correcting in video where changes can be made faster, is very useful, and is one reason for eventually transferring to tape.

8. We included a "warning" countdown device preceding single-frame sequences so the viewer could stop very close to the first frame of the sequence. These countdowns are similar to SMPTE leader.

9. Each frame is numbered, and the LaserDisc players can display these frame numbers over the picture. These frame numbers are not known until the disc is mastered. Therefore if you want to make reference to these numbers within the program, you must go to a second master disc. The frame numbers can be inserted into "blanks" that you must design into your program graphics.

The First National Kidisc does not have a "menu" or "table of contents" at the beginning of the disc itself. A list of chapters is printed on the album cover, and the information leaflet that comes with the disc describes the content of each one. When viewers wish to see only one or two specific segments (chapters), they can use the disc player's search function to locate what they want by chapter number.

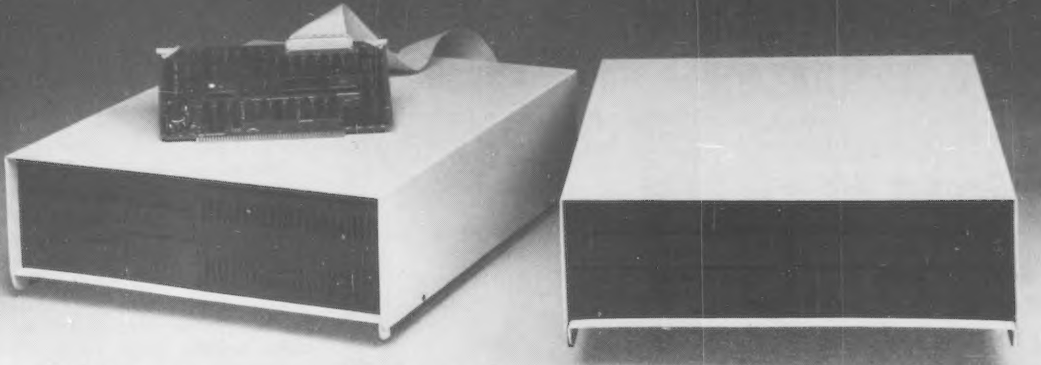
10. The LaserVision system allows self-paced viewing. How clearly you've presented your material to the viewer should no longer be judged in a "real-time" viewing. Density is the key to maximizing the LaserVision system features.

It is clear that a new approach to programming will be developed for the LaserVision videodisc system. It's been exciting for us to contribute to that new approach. It is also clear that much more is yet to come. ☐

Kidisc Available

By the time you read this, The Kidisc described here should be available from your local videodisc dealer or program distributor. It will probably be priced around $20, and contains 27 minutes of programming when played in real time.

WE'LL "DRIVE" YOU WILD



with our variety of quality disk drives.

ASAP carries only the highest quality floppy disk drives, to provide you with years of trouble-free service and superior performance.

Data Trak™ double-sided double-density drives from Qume® feature state-of-the-art technology. You get superior data integrity through improved disk life, data reliability and drive serviceability.

Data Trak™ 5 (ANSI 5¼" compatibility)	Call for price
Data Trak™ 8 (IBM compatibility)	Call for price

Shugart drives have been setting industry quality and reliability standards for years. Shugart's Bi-Compliant™ head assembly provides superior media compliance and high reliability.

Model 801 (standard floppy)	$425.00
Model 850	$640.00
Dual Disk Drive Cabinet	$265.00

ASAP also provides a full line of high reliability disk drive subsystems.

Part No. — Description*	**Price**
HDC8/1-HD — Cabinet with (1) Priam 10 megabyte hard disk drive with Microbyte Controller installed	Call for price
HDC8/1F+1HD — Cabinet with (1) Qume® DT-8 double-sided double-density drive, and (1) Priam 10 megabyte hard disk drive with Microbyte Controller installed	Call for price
CAB8H — Dual cabinet for 8" floppy disk drives (horizontal mounting)	$ 225.00
CAB8V — Cabinet for 8" floppy disk drives (vertical mounting)	$ 225.00
CAB8H/V+1S — Dual cabinet with (1) Shugart SA801R installed (horizontal or vertical mounting)	$ 750.00
CAB8H/V+2S — Dual cabinet with (2) Shugart SA801R's installed (horizontal or vertical mounting)	$1150.00
CAB8H/V+1Q — Dual cabinet with (1) Qume® DT-8 double-sided double-density drive installed (horizontal or vertical mounting)	$ 830.00
CAB8H/V+2Q — Dual cabinet with (2) Qume® DT-8's double-sided double-density drive installed (horizontal or vertical mounting)	$1350.00

*All cabinets come complete with power supply, fan and internal cables.

asap
computer
products, inc.
1198 E. Willow St., Signal Hill, CA 90806

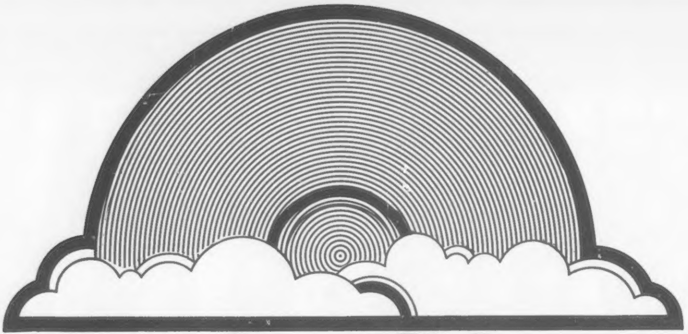
Toll free outside California:
(800) 421-7701
Inside California:
(213) 595-6431
(714) 891-2663

For superior quality, high reliability disk drives, contact ASAP today.

ASAP offers a 120-day buyer protection policy: full money-back guarantee if not totally satisfied.

Ordering information: name, address, phone; ship by: UPS or truck. Please call for shipping charges.

Terms: We accept cash, check, money orders, Visa and Master Charge (U.S. funds only). Tax: 6% Calif. res. COD's and terms available on approval (school PO's accepted).



Shopping for Video Discs

David H. Ahl

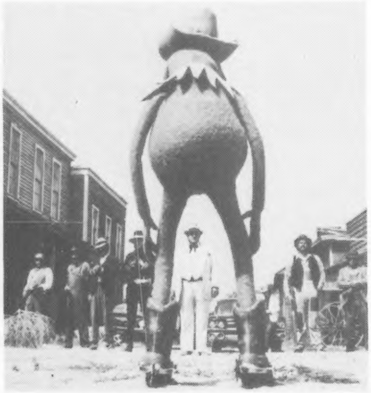
We set out to buy some Laser Vision video discs with mixed results

Being the first one on your block to own the latest technological marvel may bring some brightness into your life but it is likely to be accompanied by an equal amount of frustration. Such was the case when I acquired a Pioneer VP-1000 Laser Scan video disc player. It has all the bells and whistles that one could ask for: chapter search, frame search, freeze frame, reverse and forward slow motion, jump forward and reverse, and all of this possible from across the room by means of an infra-red remote control or by control from a computer.

"Boy, is this going to be fun," I thought. In my mind I could see adventure games based on movies such as *Jaws* where the shark would be coming at you with its jaws wide open, the movie would halt and you would have to make a decision. Make the right decision and the sequence would run backwards, perhaps in slow motion, and the shark would back away. Or, you could evoke magic which would transform you to an entirely different time and place. Make the wrong decision, of course, and you get eaten.

With such visions dancing in my head, I set out to get some laser scan video discs. The press release from the Laser-Vision Association boasts that nearly 140 discs are currently available from seven sources: Columbia Pictures, Magnetic Video, MCA, Paramount, and others.

Saturday Night Fever from Paramount Pictures was available in only one of the six stores we visited on our videodisc shopping spree.



The Muppet Movie was recently released by Magnetic Video. It was not available at the time this article was written, however, it should be in retail stores by October or November.

Macy's and Bamberger's are a large, New York based department store chain. They do a big business in electronic appliances and even have their own private label TV sets. They carry both the Magnavision and the Pioneer video disc players. Making my way to the TV department in the Morristown store, I asked the middle aged woman about video discs. She responded, "Just a minute, I'll see what we have in the back." I pointed out to her that the glass cabinet immediately behind her contained what looked like a pile of video discs. "Gee, I don't know about that," she said but unlocked the cabinet and took out its wares. She also, quite obligingly, sent a young sales girl to the back to bring out the additional discs. I said I was particularly interested in space adventure movies such as *Star Trek* or *Alien*, but that any adventure movies would do.

Unfortunately, the main titles that were in stock included *Smokey and the Bandit*, *The Jerk*, and *1941*. Kind of slim pickings.

I then set out for Livingston Mall, where several retailers were selling either the Magnavox or U.S. Pioneer players. My first stop was Sam Gordon's, a large appliance dealer with outlets all over northern New Jersey. I wandered into the store and hung around the Magnavision player for awhile. When it was apparent that no one was going to come my way, I went to the back and asked the salesman whether any laser vision discs were in stock. "Yes, I think we have some in the back," he replied. It was as though I had inquired about x-rated video cassettes. He returned a few minutes later with a battered record box containing eight or ten video discs. Again, there were only three or four titles including many of *Smokey and the Bandit* and several of

Computer Exchange

Apple II +		SAVE
★ 16K	$ 1049	22%
★ 48K	$ 1099	29%
★ 64K	$ 1258	27%
Disk II W/3.3 DOS	$ 499	23%

All are 1981 models with Apple RAM. 64K unit is 48K unit with Microsoft 16K RAM board. 64K units include Applesoft and Integer BASIC's when used with DISK II. The Apple II no longer comes with game paddles. Paddles are extra - CALL.

HARDWARE for Apple II/II+

Disk II and 3.3 Controller	$ 499	23%
Disk II only	$ 439	18%
★ **Corvus**		
5 Meg Hard Disk	CALL	CALL
10 Meg Hard Disk	CALL	CALL
20 Meg Hard Disk	CALL	CALL
Mirror	CALL	CALL
Other Corvus accessories	CALL	CALL
★ **Micro-Sci** 5" Drives for Apple II:		
A70, 286K, 5" Drive	$ 489	20%
A40, 160K, 5" Drive	$ 369	18%
Controller Card	$ 79	21%
MONITORS:		
★ **ATI:** 9" B&W	$ 119	30%
NEC 12" Color	$ 359	24%
12" Green	$ 169	22%
SANYO: 9" B&W	$ 159	32%
12" B&W	$ 229	32%
12" Green	$ 249	31%
13" Color	$ 399	38%
ZENITH 12" Green	$ 119	20%
DISKETTES, 5", box of 10:		
★ **Apple**	$ 44	21%
Maxell	$ 39	33%
Memorex	$ 25	45%
80 COLUMN VIDEO CARDS:		
Apple, Smarterm	$ 299	17%
Videx Videoterm	$ 249	18%
M&R Sup R Term	$ 319	19%
PRINTERS:		
Apple, Silentype w/Interface	$ 329	17%
Centronics 737 Interface	$ 169	33%
Centronics, 737	$ 759	26%
Epson		
MX 80	CALL	CALL
MX 80 FT	CALL	CALL
MX 100 W/Graphics	CALL	CALL
MX 80/100 Interface	CALL	CALL
MX 80 friction feed adapter	CALL	CALL
MX 80 graphics option	CALL	CALL
MISCELLANEOUS:		
Apple: Graphics Tablet	$ 695	13%
1 Yr Extended Warranty	$ 175	20%
IEEE-488 Card	$ 339	25%
CCS: Serial Interface Card	$ 139	22%
Parallel Interface Card	$ 99	20%
★ **Hayes:** Micromodem II	$ 299	26%
Smartmodem	$ 249	11%
Keyboard Company: Joystick II	$ 45	10%
Numeric Keypad	$ 119	21%
M&R: RF Modulator	$ 25	27%
SUP R FAN	$ 39	25%
★ **Microsoft:**		
Z80 Softcard	$ 299	33%
16K RAM Card	$ 159	20%
Mountain: CPS Multifunction Card	$ 209	13%
Clock/Calendar	$ 239	15%
Orange Micro Grappler	$ 129	21%
SSM AIO Serial/Para. Interface	$ 159	20%

APPLE /// CALL		SAVE
Apple Monitor 12" Green	$ 249	25%

SOFTWARE for Apple II/II+

Apple:		
Apple Fortran	$ 149	25%
Apple Pilot	$ 119	27%
Apple Plot	$ 49	30%
Apple Writer	$ 59	21%
DOS 3.3	$ 49	20%
DOS Tool Kit	$ 59	22%
Dow Jones News & Quotes	$ 69	28%
Dow Jones Portfolio Eval.	$ 45	10%
Language/Pascal System	$ 379	25%
Microcourier	$ 189	24%
Broderbund Software	CALL	CALL
★ **Central Point Software:**		
Copy II Plus	$ 35	10%
Will copy most copy protected software for your backup in 45 seconds! NEW!		
Epson, MX 80 Graphics Dump	$ 7	30%
Hayden, Sargon II (chess)	$ 29	22%
Info. Unlim. Easywriter (PRO)	$ 199	13%
★ **Insoft:**		
ALD System II	$ 110	10%
TransFORTH II	$ 110	10%
Accounting Software	$ 365	66%
A full professional quality integrated GL, A/R, A/P, Payroll package. Hotline support available. Send for free sample printouts. Requires Z80 and 16K RAM card.		
Micro Pro Wordstar	$ 239	29%
Microsoft (on disks):		
A.L.D.S.	$ 110	10%
BASIC Compiler	$ 299	25%
Cobol 80	$ 559	25%
Fortran 80	$ 149	25%
Olympic Decathlon	$ 24	24%
TASC Compiler	$ 159	22%
Typing Tutor II	$ 19	30%
Muse, Super Text II	$ 109	27%
Peachtree Software	CALL	CALL
Personal Software:		
Desktop Plan II	$ 159	21%
Visicalc 3.3	$ 159	25%
Visiplot	$ 129	28%
Visitrend Visiplot	$ 199	31%
Visidex	$ 159	30%
Visiterm	$ 109	27%
Visifile	$ 199	30%
Software Publishing:		
PFS Filing/Data Base	$ 69	28%
PFS: Report	$ 69	28%
Stoneware, DB Master (new version)	$ 179	22%

For specific software not listed, CALL

INTERTEC DATA SYSTEMS ® SUPERBRAIN™

		SAVE
★ Superbrain 64K Double Density	$ 2379	40%
Superbrain 64K Quad Density	$ 2895	28%

ATARI® ATARI® 800 16K

$739

SAVE 32%

		SAVE
Atari 820 Printer	$ 249	17%
Atari 810 Disk Drive	$ 425	29%
Atari 410 Program Recorder	$ 59	34%
Atari 16K RAM Module	$ 83	27%
Atari 850 Interface	$ 149	32%
Atari/Epson Cable	$ 29	22%
Atari Software	CALL	CALL

Above prices for mail orders only. Our store showroom is 259 Barnett Rd., Unit 2, Medford, OR. Store prices, which include software service, differ from mail order prices. No mail order sales at store. CALL ORDER DESK.

ORDERING INFORMATION:

Minimum order $100. Money Orders, Cashier Checks or Bank Wire welcomed. Visa and MC orders add 3%. Personal or company checks are accepted (allow 20 days to clear). Add 3% for shipping, handling and insurance; UPS ground is standard. 6% total for UPS Blue or 10% total for foreign orders or US Parcel Post. Include your telephone number. No COD's. Prices are subject to change without notice. Order desk hours are 8 to 5 PST, 10 to 3 Saturdays.

REFERENCES:

Custom Computer has been an Apple dealer since 1978. Our bank reference is First Interstate Bank (503) 776-5620. We belong to the Chamber of Commerce. (503) 772-6293.

apple computer
Sales and Service

We are an authorized dealer and repair center and will repair all Apple equipment regardless of where you purchased it, in or out of warranty. Normally our turn-around time on repairs is 24 hours. Call before sending equipment.

TOLL FREE
NATIONAL ORDER DESK
(800)547-1289

Repair Department
(503) 772-4401

Technical Hotline
(503) 772-3803
(CUSTOMERS ONLY-PLEASE
HAVE INVOICE # OR
PACKING SLIP #)

Oregon Order Desk
(503) 772-3803

Computer Exchange

VISA

NO SALES TAX

National Sales Dept. of CUSTOM COMPUTER
259 Barnett Rd., Unit 3, Medford, OR. 97501

925

master charge
THE INTERBANK CARD

CIRCLE 141 ON READER SERVICE CARD

OVER 70 TRS-80 PROGRAMS
ON TAPE EACH YEAR . . .
FOR UNDER $0.75 . . .
(THAT'S SIX BITS) APIECE!

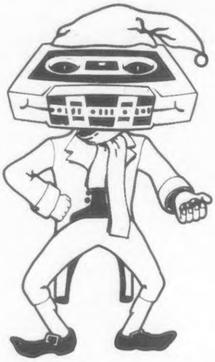
For the MODEL I & III
Ol' Ebenezer Cload wiped his glasses off — and grabbed for his gold pouch! With **CLOAD** Magazine, he could use and enjoy his computer for the price of a turkey with stuffing! And he could send Bob home early, since the programs did not have to be typed in!

He now gets a 30 minute tape each month with 7 or more practical, tutorial, utility, and game programs to **CLOAD** and run. While he **CLOADs** the programs, he reads the editor's babblings that come with each tape.

Don't let ghostly images cloud your TRS-80's screen. Get a subscription to **CLOAD** Magazine!

The Bottom Line:
1 year (12 issues) $42.00
6 months (6 issues) $23.00
Single copies $4.50
Anthology #1 .... $10.00
Anthology #2 .... $15.00
MasterCard/Visa/Gold also welcome

The Fine Print:
Issues are sent First Class Mail.
All issues from Oct. 78 on available — ask for list (24 Level I issues also).
Programs are for 16K Level II, 16K Model III, and occasionally for disks.
Calif. residents add 6% to single copies and anthologies. Overseas — add $10 to subscriptions, $5 to anthologies, and $1 to single copies. Sent AO rate.
TRS-80 is a trademark of Tandy Corporation.



CLOAD Magazine Inc. © 1981
P.O. Box 1448 Santa Barbara, CA 93102 (805) 962-6271

For the COLOR COMPUTER:
You just spent your vacation money on the Extended BASIC Color Computer, and now you want to buy software!!!???

Don't skip meals — get **CHROMASETTE** Magazine! Each month your computer will get a balanced diet of 6 or more programs on cassette (just load and run!). Also, along with the tape comes some notes on the programs and tidbits on the Color Computer world.

CHROMASETTE Magazine — for those who relish every byte (that pun even hurt me).

Chromasette

The Bottom Line:
1 year (12 issues) $45.00
6 months (6 issues) $25.00
Single copies $5.00
Calif. residents add 6% to single copies.
Overseas — add $10 to subscriptions, and $1 to single copies. Sent AO rate.

The Fine Print:
Issues are sent First Class Mail.
All issues from July 81 on available – ask for list. Programs are for the Extended BASIC model only.

MasterCard/Visa welcome!

Chromasette Magazine
P.O. Box 1087 Santa Barbara, CA 93102 (805) 963-1066

CIRCLE 111 ON READER SERVICE CARD

Shopping, continued...

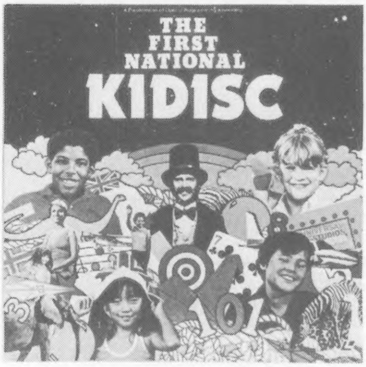
The Jerk. All the titles were ones that were originally furnished to stores with the Magnavox players nearly a year ago. I asked if more titles were due in and got the same response as I did at Bamberger's, "I don't know. The home office does the buying." I thanked him and went on to my next stop.

My third stop was Sam Goody's, a large retailer of records, tapes and audio equipment. Goody's was featuring the Pioneer player but, like the other two shops, it was not running nor was anyone around who seemed to know very much about it. However, nearby were six record bins of video discs. Four of the bins had discs in the VHD (RCA Selectavision) format whereas two of the bins contained laser vision discs. Unfortunately, most of what was in the bins were the disc separator cards with the titles emblazoned on them and very few discs. Inevitably, *Smokey and the Bandit*, *The Jerk*, *1941* and *Saturday Night Fever* were in stock and about seven additional titles, none of which were in the space or adventure genre.

So far, three stores and all I had seen were the same handful of MCA titles that were distributed with the original Magnavox players nearly a year ago. Just two titles from Paramount, and none from Magnetic Video, Columbia, or any of the others who were supposedly producing laser vision discs. "Ah, well," thought I, "tomorrow is another day."

A few dozen phone calls indicated that some of the video-only shops had a better selection of video discs than department stores and other consumer electronics retailers. Hence, my next stop was Video Shack on Route 46 in Parsippany. Upon entering I was immediately greeted by three young salesmen all offering their help. A four-tier display rack of laser scan video discs was immediately to the left of the entrance. I told one salesman I was interested in space adventure titles and he immediately pointed out *Star Trek-The Motion Picture*, however, that was the only one in stock. Unquestionably, they had a larger array of titles than my previous stops although most of them were still from MCA. Titles included: *The Incredible Shrinking Woman*, *Grease*, *Jaws II*, *Abba*, and the all-too-familiar, *The Jerk*.

I asked whether they expected any titles in from Magnetic Video such as *The Alien* and *The Muppet Movie*, the salesman told me that "No, there would be no titles forthcoming from Magnetic Video as the company was owned by MGM, who was a major backer of the RCA CED video disc format and, therefore, would not be issuing any laser scan titles." I knew this not to be the case and questioned the other salesman and the owner. They concurred, that indeed Magnetic Video would not be issuing any laser scan titles but that maybe someone else would do so and that I ought to wait six months and then go disc shopping. I asked further about other companies making laser scan titles and was assured that the only people in the market now or for the forseeable future were MCA, Columbia, and Paramount (I'm sure the folks at Pioneer Artists, Magnetic Video, and Optical Programming Associates (OPA) would not be pleased to hear that news). I thanked them for their help and set out in my car for the shopping center jungle in Paramus.



The First National Kidisc, produced by Optical Programming Associates, is a widely-acclaimed "interactive" disk. Unfortunately, we did not find it widely available at the retail level.

My first stop in shopping mall jungle was Colonial Magnavox in Bergen Mall. Upon entering the store I was delighted to see four or five video discs to the left of the entrance along with a broad array of video tapes. However I then noticed in the back of the store an entire wall of over 50 titles of video discs. While most of the titles were from the MCA catalog, a few Paramount and OPA most notably *Kidisc* and *How To Watch Pro-football* were also represented. Like my previous stop, the shopkeeper knew nothing about the entry of Magnetic Video into the field and was only vaguely aware that Columbia was about to release several titles. Unfortunately, this excellent selection of discs had one major drawback: prices were about $5 per disc higher than any place else I visited. Nevertheless, I shelled out $29.95 for *Buck Rogers In The 25th Century* and went on my way.

My next stop was about a mile east on Route 4 at the Video Shack, part of a five-store New York-based chain. The entry to the store is like a small theater lobby; to the left is a miniature theater with large stuffed animals looking up at a mocked-up video screen. The main part of the store is open and roomy and lined from floor to ceiling on three sides with the largest collection of video tapes and discs I've ever seen in one place. One corner was devoted to laser scan video discs and virtually every MCA title as well as a good cross section of the Paramount and OPA catalogs were in stock. The young salesman immediately came over and offered his assistance and proved exceptionally knowledgeable about existing titles, ones about to go out of print, and new titles and labels entering the field. He told me that he expected Magnetic Video titles in about a month and that a concert series from Pioneer Artists would also be forthcoming. I was impressed by the cleanliness of the store, the knowledge of the salesman and the discounted prices (about 18% off retail). I bought *Roller Coaster*, a movie with plenty of action to integrate into an adventure game, for $25.50. Video Shack, incidentally, carries no hardware; only media (and/or software).

Crossing over to the other side of Route 4 on one of the most complicated U-turns I've ever seen, I made for my next stop, Theatervision. A heavy user of radio commercials, Theatervision is both a hardware and media dealer. The store was a hodge podge of cameras, TV sets and, in the back, a room set aside for large screen and projection TV sets. A magazine-type rack contained about 25 titles each of CED and LV video discs. After getting a demonstration of projection TV sets and deciding that $3,000+ was a bit more than my budget could stand, I settled for *The Great Waldo Pepper* for the lowest price yet, $24.95. Only MCA discs were in stock. The salesman "expected others soon," but couldn't tell me what or when.

What are my conclusions from this shopping spree? The first one is that clearly there is a much greater selection of discs to be found at video-oriented stores than at department stores and audio stores. For the very best selection, a video-media-only outlet is probably the best bet. Another advantage to shopping at video-oriented outlets is that their prices tend to be somewhat lower than full-line stores. Another conclusion: don't believe everything you see in advertisements or a catalog. Just like the computer field, manufacturers are prone to announce products before they are available at the retail level. On the other hand, sales people are not necessarily the best source of information either. The more you can find out about what is going on in the field, the better off you are. In other words, become an informed consumer in any way you can: through magazines, shows, advertising, and by shopping around.

Coming in a future issue of *Creative Computing*: reviews of a representative sampling of video discs with an eye toward making them the basis of a computer game as well as, of course, their entertainment value. ☐

BYTES & PIECES

10644 Garden Grove Blvd., Suite 120,
Garden Grove, CA 92643 (714) 963-0087

ALL ITEMS IN STOCK

HARDWARE

APPLE	
Apple II 48K+	1,295.00
Disk Drive 3.3	593.00
Disk Drive w/o Contr.	507.00
ADVANCED BUS. TECH.	
10 Key Pad (New)	93.48
AMDEK	
Video 100 12" B & W	136.80
Low-Res 12" Color Mon	393.30
12" Green Monitor	165.30
ANADEX 9501	1,398.15
CALIF. COMP. SYS.	
64K Static Ram	490.20
Mainframe	341.45
Integrated System	1,755.00
Disk w/Contr./CPM	291.85
Motherboard	91.00
Z-80 CPU	229.75
Asynchronous Ser. Intface	111.75
Synchronous Ser. Intface	134.55
Parallel Interface	86.65
Centronics Parallel	86.65
COMPUTER STATION	
Dithertizer II w/Camera	524.40
DANA IND. Cooling Fan	34.00
EPSON MX-80	529.00
Apple Parallel Intface w/Cable	82.86
DC HAYES	
Micromodem II	280.45
Micromoden S-100	318.00
Haystack	216.60
HIGH TEC. 1-Hr Juice	222.50
LAZER	
Lower Case Adapter	50.20
Keybd Plus	86.00
M & R	
RF Modulator	20.55
80 - Col. Video Card	296.50
MICRO SCI	
40 Disk Dr. wo/Contr	370.50
40 Disk Dr. w/Contr	450.00
70 Disk Dr. wo/Contr	496.00
70 Disk Dr. w/Contr	576.00
MICRO SOFT	
Z-80 Soft Card	296.00
16K Ram Card	144.50
MOUNTAIN COMP.	
CPS Multi-Func. Card	165.00
Music System	435.50
Supertalker	240.00
NEC	
Green Screens	224.00
Low-Res Color	395.00
DAN PAYMAR	
Lower Case Adapter/New	30.80
SANYO	
B & W - Call for price/Color 13"	427.50
SOLID STATE MUSIC	
SSM A10 Card	147.00
IEEE-488 Controller	405.00
STREET ELECT.	
Echo Speech Synthesizer	180.00
GAME PADDLES	27.36
JOY STICK	42.00
TRENDCOM	
200 Printer	439.00
Standard Intface	60.00
Graphics Intface	80.00
VIDEX	
80 - Col Card	257.00
Switch Plate	14.00
Keybd Enhancer/New & Old	95.50

SOFTWARE

CONTINTENTAL	
Home Money Minder	24.00
CPA Gen. Ledger	171.00
CPA A/R	171.00
CPA A/P	171.00
CPA P/R	171.00
INNOVATIVE DESIGN	
Pool 1.5	24.00
MESA RES. Invest. Decisions	68.50
MICRO PRO	
Word Star	213.00
Super Sort	114.00
Mail Merger	71.25
MICRO SOFT	
Typing Tutor	13.70
Adventure	20.50
Olympic Decathlon	20.50
Fortran	133.40
PERSONAL SOFTWARE	
Zork	29.70
Visicalc 3.3	148.00
Visiterm	112.00
Visidex	148.00
Visiplot	133.40
Visicombo	193.00
Desktop Plan II	148.00
CCA Data Mgt	74.00
PROGRAMMA - Word Processors	
Regular	103.00
Superterm	103.00
Videx	103.00
Smarterm	103.00
Double Vision	103.00
SOFTWARE SORCERY	
B.I.T.S.	38.00
P.I.T.S.	38.00
P.U.M.P.	25.00
SOUTHEASTERN Data Capture 4.0	42.00
SOUTHWESTERN	
ASC II Express	52.00
Z-Term	80.00
STONEWARE D.B. Master	165.00
SUB LOGIC	
Flight Simulator	25.00
3D Graphics Pak	44.50
Saturn Navigator	18.50
SYNERGISTIC	
Linguist	27.40
Mail List Database	34.00
Modifiable Database	54.00
Data Reporter	137.00
Modifiable Database II	102.60

Money Orders & Cert. Cks. Imm. Del./Per. Cks. allow 2 weeks.
No C.O.D.'s Add 3% Frt & Hdl. Calif. add 6% Tax. All Mfg. warranties apply.
All orders must include NAME, ADDRESS & PHONE.
Prices subject to change.

CIRCLE 125 ON READER SERVICE CARD

DYNACOMP

Quality software for:*

ATARI
PET
APPLE II Plus
TRS-80 (Level II)**
NORTH STAR
CP/M Disks/Diskettes

CARD GAMES

BRIDGE 2.0 (Available for all computers) **Price: $17.95 Cassette/$21.95 Diskette**
An all-inclusive version of this most popular of card games. This program both BIDS and PLAYS either contract or duplicate bridge. Depending on the contract, your computer opponents will either play the offense OR defense. If you bid too high, the computer will double your contract! BRIDGE 2.0 provides challenging entertainment for advanced players and is an excellent learning tool for the bridge novice. See the software review in 80 Software Critique. Rated #1 by Creative Computing.

HEARTS 1.5 (Available for all computers) **Price: $15.95 Cassette/$19.95 Diskette**
An exciting and entertaining computer version of this popular card game. Hearts is a trick-oriented game in which the purpose is not to take any hearts or the queen of spades. Play against two computer opponents who are armed with hard-to-beat playing strategies. HEARTS 1.5 is an ideal game for introducing the uninitiated (your spouse) to computers. See the software review in 80 Software Critique.

STUD POKER (Atari only) **Price: $11.95 Cassette/$15.95 Diskette**
This is the classic gambler's card game. The computer deals the cards one at a time and you (and the computer) bet on what you see. The computer does not cheat and *usually* bets the odds. However, it sometimes bluffs! Also included is a five card draw poker betting practice program. This package will run on a 16K ATARI. Color, graphics, sound. See review in COMPUTE.

POKER PARTY (Available for all computers) **Price: $17.95 Cassette/$21.95 Diskette**
POKER PARTY is a draw poker simulation based on the book, POKER, by Oswald Jacoby. This is the most comprehensive version available for microcomputers. The party consists of yourself and six other (computer) players. Each of these players (you will get to know them) has a different personality in the form of a varying propensity to bluff or fold under pressure. Practice with POKER PARTY before going to that expensive game tonight! Apple cassette and diskette versions require a 32 K (or larger) Apple II.

CRIBBAGE 2.0 (TRS-80 only) **Price: $14.95 Cassette/$18.95 Diskette**
This is simply the best cribbage game available. It is an excellent program for the cribbage player in search of a worthy opponent as well as for the novice wishing to improve his game. The graphics are superb and assembly language routines provide rapid execution. See the software review in 80 Software Critique.

THOUGHT PROVOKERS

MANAGEMENT SIMULATOR (Atari, North Star and CP/M only) **Price: $19.95 Cassette**
$23.95 Diskette
This program is both an excellent teaching tool as well as a stimulating intellectual game. Based upon similar games played at graduate business schools, each player or team controls a company which manufacturers three products. Each player attempts to outperform his competitors by setting selling prices, production volumes, marketing and design expenditures etc. The most successful firm is the one with the highest stock price when the simulation ends.

FLIGHT SIMULATOR (Available for all computers) **Price: $17.95 Cassette/$21.95 Diskette**
A realistic and extensive mathematical simulation of take-off, flight and landing. The program utilizes aerodynamic equations and the characteristics of a real airfoil. You can practice instrument approaches and navigation using radials and compass headings. The more advanced flyer can also perform loops, half-rolls and similar aerobatic maneuvers. Although this program does not employ graphics, it is exciting and very addictive. See the software review in COMPUTRONICS. Runs in 16K Atari.

VALDEZ (Available for all computers) **Price: $15.95 Cassette/$19.95 Diskette**
VALDEZ is a computer simulation of supertanker navigation in the Prince William Sound/Valdez Narrows region of Alaska. Included in this simulation is a realistic and extensive 256 × 256 element map, portions of which may be viewed using the ship's alphanumeric radar display. The motion of the ship itself is accurately modelled mathematically. The simulation also contains a model for the tidal patterns in the region, as well as other-traffic (outgoing tankers and drifting icebergs). Chart your course from the Gulf of Alaska to Valdez Harbor! See the software review in 80 Software Critique.

BACKGAMMON 2.0 (Atari, North Star and CP/M only) **Price: $14.95 Cassette/$18.95 Diskette**
This program tests your backgammon skills and will also improve your game. A human can compete against a computer or against another human. The computer can even play against itself. Either the human or the computer can double or generate dice rolls. Board positions can be created or saved for replay. BACKGAMMON 2.0 plays in accordance with the official rules of backgammon and is sure to provide many fascinating sessions of backgammon play.

CHECKERS 3.0 (PET only) **Price: $16.95 Cassette/$20.95 Diskette**
This is one of the most challenging checkers programs available. It has 10 levels of play and allows the user to change skill levels at any time. Although providing a very tough game at level 4-8, CHECKERS 3.0 is practically unbeatable at levels 9 and 10.

CHESS MASTER (North Star and TRS-80 only) **Price: $19.95 Cassette/$23.95 Diskette**
This complete and very powerful program provides five levels of play. It includes castling, en passant captures and the promotion of pawns. Additionally, the board may be preset before the start of play, permitting the examination of "book" plays. To maximize execution speed, the program is written in assembly language (by SOFTWARE SPECIALISTS of California). Full graphics are employed in the TRS-80 version, and two widths of alphanumeric display are provided to accommodate North Star users. See review in onComputing.

LEM LANDER (32K Apple Disk only) **Price: $16.95 Diskette**
Pilot your LEM LANDER to a safe landing on any of nine different surfaces ranging from smooth to treacherous. The game paddles are used to control craft attitude and thrust. This is a real-time high res challenge!

FOREST FIRE! (Atari only) **Price: $16.95 Cassette/$20.95 Diskette**
Using excellent graphics and sound effects, this simulation puts you in the middle of a forest fire. Your job is to direct operations to put out the fire while compensating for changes in wind, weather and terrain. Not protecting valuable structures can result in startling penalties. Life-like variables are provided to make FOREST FIRE! very suspenseful and challenging. No two games have the same setting and there are 3 levels of difficulty.

NOMINOES JIGSAW (Atari, Apple and TRS-80 only) **Price: $16.95 Cassette/$20.95 Diskette**
A jigsaw puzzle on your computer! Complete the puzzle by selecting your pieces from a table consisting of 60 different shapes. NOMINOES JIGSAW is a virtuoso programming effort. The graphics are superlative and the puzzle will challenge you with its three levels of difficulty. Scoring is based upon the number of guesses taken and by the difficulty of the board set-up. See review in ELECTRONIC GAMES.

MONARCH (Atari only) **Price: $11.95 Cassette/$15.95 Diskette**
MONARCH is a fascinating economic simulation requiring you to survive an 8-year term as your nation's leader. You determine the amount of acreage devoted to industrial and agricultural use, how much food to distribute to the populace and how much should be spent on pollution control. You will find that all decisions involve a compromise and that it is not easy to make everyone happy.

CHOMPELO (Atari only) **Price: $11.95 Cassette/$15.95 Diskette**
CHOMPELO is really two challenging games in one. One is similar to NIM; you must bite off part of a cookie, but avoid taking the poisoned portion. The other game is the popular board game REVERSI. It fully uses the Atari's graphics capability, and is hard to beat. This package will run on a 16K system.

SPACE LANES (Available for all computers) **Price: $14.95 Diskette**
SPACE LANES is a simple but exciting space transportation game which involves up to four players (including the computer). The object is to form and expand space transportation companies in a competitive environment. The goal is to amass more net worth than your opponent. The economics include stock purchases and company mergers. Watch your wealth grow!

**ATARI, PET, TRS-80, NORTHSTAR, CP/M and IBM are registered tradenames and/or trademarks.*

***Except where noted, all model I software is available for the Model III. TRS-80 diskettes are not supplied with DOS or BASIC.*

CIRCLE 136 ON READER SERVICE CARD

DYNACOMP OFFERS THE FOLLOWING

- Widest variety
- Guaranteed quality
- Fastest delivery
- Friendly customer service
- Free catalog
- 24 hour order phone

AND MORE...

STARTREK 3.2 (Available for all computers) **Price: $11.95 Cassette/$15.95 Diskette**
This is the classic Startrek simulation, but with several new features. For example, the Klingons now shoot at the Enterprise without warning while also attacking starbases in other quadrants. The Klingons also attack with both light and heavy cruisers and move when shot at! The situation is hectic when the Enterprise is besieged by three heavy cruisers and a starbase S.O.S. is received! The Klingons get even! See the software reviews in A.N.A.L.O.G., 80 Software Critique and Game Merchandising.

BLACK HOLE (Apple only) **Price: $14.95 Cassette/$18.95 Diskette**
This is an exciting graphical simulation of the problems involved in closely observing a black hole with a space probe. The object is to enter and maintain, for a prescribed time, an orbit close to a small black hole. This is to be achieved without coming so near the anomaly that the tidal stress destroys the probe. Control of the craft is realistically simulated using side jets for rotation and main thrusters for acceleration. This program employs Hi-Res graphics and is educational as well as challenging.

SPACE TILT (Apple and Atari only) **Price: $10.95 Cassette/$14.95 Diskette**
Use the game paddles to tilt the plane of the TV screen to "roll" a ball into a hole in the screen. Sound simple? Not when the hole gets smaller and smaller! A built-in timer allows you to measure your skill against others in this habit-forming action game.

MOVING MAZE (Apple and Atari only) **Price: $10.95 Cassette/$14.95 Diskette**
MOVING MAZE employs the games paddles to direct a puck from one side of a maze to the other. However, the maze is dynamically (and randomly) built and is continually being modified. The objective is to cross the maze without touching (or being hit by) a wall. Scoring is by an elapsed time indicator, and three levels of play are provided.

ALPHA FIGHTER (Atari only) **Price: $14.95 Cassette/$18.95 Diskette**
Two excellent graphics and action programs in one! ALPHA FIGHTER requires you to destroy the alien starships passing through your sector of the galaxy. ALPHA BASE is in the path of an alien UFO invasion; let five UFO's get by and the game ends. Both games require the joystick and get progressively more difficult the higher you score! ALPHA FIGHTER will run on 16K systems.

THE RINGS OF THE EMPIRE (Atari only) **Price: $16.95 Cassette/$20.95 Diskette**
The empire has developed a new battle station protected by rotating rings of energy. Each time you blast through the rings and destroy the station, the empire develops a new station with more protective rings. This exciting game runs on 16K systems, employs extensive graphics and sound and can be played by one or two players.

INTRUDER ALERT (Atari only) **Price: $16.95 Cassette/$20.95 Diskette**
This is a fast paced graphics game which places you in the middle of the "Dreadstar" having just stolen its plans. The droids have been alerted and are directed to destroy you at all costs. You must find and enter your ship to escape with the plans. Five levels of difficulty are provided. INTRUDER ALERT requires a joystick and will run on 16K systems.

GIANT SLALOM (Atari only) **Price: $14.95 Cassette/$18.95 Diskette**
This real-time action game is guaranteed addictive! Use the joystick to control your path through slalom courses consisting of both open and closed gates. Choose from different levels of difficulty, race against other players or simply take practice runs against the clock. GIANT SLALOM will run on 16K systems.

TRIPLE BLOCKADE (Atari only) **Price: $14.95 Cassette/$18.95 Diskette**
TRIPLE BLOCKADE is a two-to-three player graphics and sound action game. It is based on the classic video arcade game which millions have enjoyed. Using the Atari joysticks, the object is to direct your blockading line around the screen without running into your opponent(s). Although the concept is simple, the combined graphics and sound effect lead to "high anxiety".

GAMES PACK I (Available for all computers) **Price: $10.95 Cassette/$14.95 Diskette**
GAMES PACK I contains the classic computer games of BLACKJACK, LUNAR LANDER, CRAPS, HORSERACE, SWITCH and more. These games have been combined into one large program for ease in loading. They are individually accessed by a convenient menu. This collection is worth the price just for the DYNACOMP version of BLACKJACK.

GAMES PACK II (Available for all computers) **Price: $10.95 Cassette/$14.95 Diskette**
GAMES PACK II includes the games CRAZY EIGHTS, JOTTO, ACEY-DUCEY, LIFE, WUMPUS and others. As with GAMES PACK I, all the games are loaded as one program and are called from a menu. You will particularly enjoy DYNACOMP's version of CRAZY EIGHTS.

Why pay $7.95 or more per program when you can buy a DYNACOMP collection for just $10.95?

MOON PROBE (Atari and North Star only) **Price: $11.95 Cassette/$15.95 Diskette**
This is an extremely challenging "lunar lander" program. The user must drop from orbit to land at a predetermined target on the moon's surface. You control the thrust and orientation of your craft plus direct the rate of descent and approach angle.

SPACE TRAP (Atari only, 16K) **Price: $14.95 Cassette/$18.95 Diskette**
This galactic "shoot'em up" arcade game places you near a black hole. You control your spacecraft using the joystick and attempt to blast as many of the alien ships as possible before the black hole closes about you.

ADVENTURE

CRANSTON MANOR ADVENTURE (North Star and CP/M only) **Price: $21.95 Diskette**
At last! A comprehensive Adventure game for North Star and CP/M systems. CRANSTON MANOR ADVENTURE takes you into mysterious CRANSTON MANOR where you attempt to gather fabulous treasures. Lurking in the manor are wild animals and robots who will not give up the treasures without a fight. The number of rooms is greater and the associated descriptions are much more elaborate than the current popular series of Adventure programs, making this game the top in its class. Play can be stopped at any time and the status stored on diskette. Not available in 5¼" CP/M format.

GUMBALL RALLY ADVENTURE (North Star only, 48K) **Price: $21.95 Diskette**
Take part in this outlaw race from the east coast to the west coast. The goal is to find your way to the finish line while maintaining the highest possible speed. You may choose one of five cars available at the garage. The choice will affect your speed and range. Remember to take spare parts and don't get caught speeding!

SPEECH SYNTHESIS

DYNACOMP is now distributing the new and revolutionary TYPE-'N-TALK^{TM} (TNT) speech synthesizer from Votrax. Simply connect TNT to your computer's serial interface, enter text from the keyboard and hear the words spoken. TNT is the easiest-to-program speech synthesizer on the market. It uses the least amount of memory and provides the most flexible vocabulary available anywhere!

Price: $329.95 (Please add $4.00 for shipping and handling)

TNT Software

The following DYNACOMP programs are available for use with TNT:

STUD POKER (Atari, 24K)
NOMINOES JIGSAW (Atari, 24K)
TEACHER'S PET I (Atari and North Star)
BRIDGE 2.0 (North Star)
CHOMPELO (Atari, 24K)

TALK TO ME (T'N'T Atari only, 24K) **Price: $14.95 Cassette/$18.95 Diskette**
This program presents a superb tutorial on speech synthesis using the Atari 800 and TYPE 'N TALK^{TM}. TALK TO ME will illustrate normal word generation as well as phoneme generation. The documentation includes many helpful programming tips.

Please specify 'TNT' versions when ordering.

ABOUT DYNACOMP

DYNACOMP is a leading distributor of small system software with sales spanning the world (currently in excess of 40 countries). During the past two years we have greatly enlarged the DYNACOMP product line, but have maintained and improved our high level of quality and customer support. The achievement in quality is apparent from our many repeat customers and the software reviews in such publications as COMPUTRONICS, 80 Software Critique and A.N.A.L.O.G. Our customer support is as close as your phone. It is always friendly. The staff is highly trained and always willing to discuss products or give advice.

BUSINESS and UTILITIES

SPELLGUARD^{TM} (8" CP/M only) **List Price: $269, DYNACOMP Price: $219.95 Disk**
SPELLGUARD is a revolutionary new product which increases the value of your current word processing system (WORDSTAR, MAGIC WAND, ELECTRIC PENCIL, TEXTED EDITOR II and others). Written entirely in assembly language, SPELLGUARD^{TM} rapidly assists the user in eliminating spelling and typographical errors by comparing each word of the text against a dictionary (expandable) of over 20,000 of the most common English words. Words appearing in the text but not found in the dictionary are "flagged" for easy identification and correction. Most administrative staff familiar with word processing equipment will be able to use SPELLGUARD^{TM} in only a few minutes.

MAIL LIST 2.2 (Apple, Atari and North Star diskette only) **Price: $34.95**
This program is unmatched in its ability to store a maximum number of addresses on one diskette (minimum of 1100 per diskette, more than 2200 for "double density" systems!). Its many features include alphabetic and zip code sorting, label printing (1, 2, or 3 up), merging of files and a unique keyword seeking routine which retrieves entries by a virtually limitless selection of user defined codes. Mail List 2.2 will even find and delete duplicate entries. A very valuable program!

FORM LETTER SYSTEM rel. 2 (Atari, North Star and Apple Diskettes only) **Price: $34.95**
FORM LETTER SYSTEM (FLS) is the ideal program for creating and editing form letters and address lists. It contains an easy-to-use text editor which produces fully justified text. Special codes are used in the address list to obtain personalized salutations. Form letters are produced by automatically inserting each address into a predetermined portion of your letter. FLS is completely compatible with MAIL LIST 2.2, which may be used to manage and sort your address files.

FLS and MAIL LIST 2.2 are available as a combined package for $59.95.

SORTIT (North Star only) **Price: $29.95 Diskette**
SORTIT is a general purpose sorting program written in 8080 assembly language. This program will sort sequential data files generated by NORTH STAR BASIC. Primary and optional secondary keys may be numeric or one to nine character strings. SORTIT is easily used with files generated by DYNACOMP's MAIL LIST program and is very versatile in its capabilities for all other BASIC data file sorting.

PERSONAL FINANCE SYSTEM (Atari and North Star only) **Price: $34.95 Diskette**
PFS is a single diskette, menu-oriented system composed of ten different programs. Besides recording your expenses and tax deductible items, PFS will sort and summarize expenses by payee, and display information on expenditures by any of 26 user defined codes by month or by payee. PFS will even produce monthly bar graphs of your expenses by category! This powerful package requires only one disk drive, minimal memory (24K Atari, 32K North Star) and will store up to 600 records per disk (and over 1000 records per disk by making a few simple changes to the programs). You can record checks plus cash expenses so that you can finally see where your money goes and eliminate guesswork and tedious hand calculations.

FAMILY BUDGET (Apple only) **Price: $34.95 Diskette**
FAMILY BUDGET is a very convenient financial record-keeping program. You will be able to keep track of cash and credit expenditures as well as income on a daily basis. You can record tax deductible items and charitable donations. FAMILY BUDGET also provides a continuous record of all credit transactions. You can make daily cash and charge entries to any of 21 different expense accounts as well as to 5 payroll and tax accounts. Data are easily retrieved giving the user complete control over an otherwise complicated (and unorganized!) subject.

INTELINK (Atari only) **Price: $49.95 Diskette**
This software package contains a menu-driven collection of programs for facilitating efficient two-way communications through a full duplex modem (required for use). In one mode of operation you may connect to a data service (e.g., The SOURCE or MicroNet) and quickly load data such as stock quotations onto your diskette for later viewing. This greatly reduces "connect time" and thus the service charge. You may also record the complete contents of a communications session. Additionally, programs written in BASIC, FORTRAN, etc. may be built off-line using the support text editor and later "uploaded" to another computer, making the Atari a *very* smart terminal. Even Atari BASIC programs may be uploaded. Further, a command file may be built off-line and used later as controlling input for a time-share system. That is, you can set up your sequence of time-share commands and programs, and the Atari will transmit them as needed; batch processing. All this adds up to saving both connect time and your time.

TEXT EDITOR II (CP/M) **Price: $29.95 Diskette/$33.45 Disk**
This is the second release version of DYNACOMP's popular TEXT EDITOR I and contains many new features. With TEXT EDITOR II you may build text files in chunks and assemble them for later display. Blocks of text may be appended, inserted or deleted. Files may be saved on disk/diskette in right justified/centered format to be later printed by either TEXT EDITOR II or the CP/M ED facility. Futher, ASCII CP/M files (including BASIC and assembly language programs) may be read by the editor and processed. In fact, text files can be built using ED and later formatted using TEXT EDITOR II. All in all, TEXT EDITOR II is an inexpensive, easy to use, but very flexible editing system.

DFILE (Atari and North Star diskettes only) **Price: $19.95**
This handy program allows North Star and Atari disk users to maintain a specialized data base of all files and programs in the stack of disks which invariably accumulates. DFILE is easy to set up and use. It will organize your disks to provide efficient locating of the desired file or program.

FINDIT (North Star only) **Price: $19.95**
This is a three-in-one program which maintains information accessible by keywords of three types: Personal (eg: last name), Commercial (eg: plumbers) and Reference (eg: magazine articles, record albums, etc). In addition to keyword searches, there are birthday, anniversary and appointment searches for the personal records and appointment searches for the commercial records. Reference records are accessed by a single keyword or by cross-referencing two or three keywords.

SHOPPING LIST (Atari only) **Price: $12.95 Cassette/$16.95 Diskette**
SHOPPING LIST stores information on items you purchase at the supermarket. Before going shopping, it will remind you of all the things you might need, and then display (or optionally print) your shopping list and the total cost. Adding, deleting, changing and storing data is very easy. Runs with 16K.

TAX OPTIMIZER (North Star only) **Price: $59.95 Diskette**
The TAX OPTIMIZER is an easy-to-use, menu oriented software package which provides a convenient means for analyzing various income tax strategies. The program is designed to provide a quick and easy data entry. Income tax is computed by all tax methods (regular, income averaging, maximum and alternate minimum tax). The user may immediately observe the tax effect of critical financial decisions. TAX OPTIMIZER has been thoroughly field tested in CPA offices and comes complete with the current tax tables in its data files. TAX OPTIMIZER is tax deductible!

EDUCATION

HODGE PODGE (Apple only, 48K Applesoft or Integer BASIC) **Price: $19.95 Cassette/$23.95 Diskette**
Let HODGE PODGE be your child's baby sitter. Pressing any key on your Apple will result in a different and intriguing "happening" related to the letter or number of the chosen key. The program's graphics, color and sound are a delight for children from ages 1½ to 9. HODGE PODGE is a non-intimidating teaching device which brings a new dimension to the use of computers in education.

TEACHER'S PET I (Available for all computers) **Price: $11.95 Cassette/$15.95 Diskette**
This is the first of DYNACOMP's educational packages. Primarily intended for pre-school to grade 3, TEACHER'S PET provides the young student with counting practice, letter-word recognition and three levels of math skill exercises.

MISCELLANEOUS

CRYSTALS (Atari only) **Price: $ 9.95 Cassette/$13.95 Diskette**
A unique algorithm randomly produces fascinating graphics displays accompanied with tones which vary as the patterns are built. No two patterns are the same, and the combined effect of the sound and graphics are mesmerizing. CRYSTALS has been used in local stores to demonstrate the sound and color features of the Atari.

NORTH STAR SOFTWARE EXCHANGE (NSSE) LIBRARY
DYNACOMP now distributes the 23 volume NSSE library. These diskettes each contain many programs and offer an outstanding value for the purchase price. They should be part of every North Star user's collection. Call or write DYNACOMP for details regarding the contents of the NSSE collection.

Price: $9.95 each/$7.95 each (4 or more)
The complete collection may be purchased for $149.95

DYNACOMP CASSETTES

DYNACOMP now offers high quality DYNACOMP brand name C-20 cassettes for computer use. Each cassette is guaranteed to be defect-free.

Box of 10 cassettes: $15.95 postpaid
Box of 20 cassettes: $29.95 postpaid

AVAILABILITY

DYNACOMP software is supplied with complete documentation containing clear explanations and examples. Unless otherwise specified, all programs will run within 16K program memory space (ATARI requires 24K). Except where noted, programs are available on ATARI, PET, TRS-80 (Level II) and Apple (Applesoft) cassette and diskette as well as North Star single density (double density compatible) diskette. Additionally, most programs can be obtained on standard (IBM format) 8" CP/M floppy disks for systems running under MBASIC. 5¼" CP/M diskettes are available for North Star and Osborne computer systems.

STATISTICS and ENGINEERING

DIGITAL FILTER (Available for all computers) **Price: $39.95 Cassette/$43.95 Diskette**
DIGITAL FILTER is a comprehensive data processing program which permits the user to design his own filter function or choose from a menu of filter forms. The filter forms are subsequently converted into non-recursive convolution coefficients which permit rapid data processing. In the explicit design mode the shape of the frequency transfer function is specified by directly entering points along the desired filter curve. In the menu mode, ideal low pass, high pass and bandpass filters may be approximated to varying degrees according to the number of points used in the calculation. These filters may optionally also be smoothed with a Hanning function. In addition, multi-stage Butterworth filters may be selected. Features of DIGITAL FILTER include plotting of the data before and after filtering, as well as display of the chosen filter functions. Also included are convenient data storage, retrieval and editing procedures.

DATA SMOOTHER (Not available for Atari) **Price: $19.95 Cassette/$23.95 Diskette**
This special data smoothing program may be used to rapidly derive useful information from noisy business and engineering data which are equally spaced. The software features choice in degree and range of fit, as well as smoothed first and second derivative calculation. Also included is automatic plotting of the input data and smoothed results.

FOURIER ANALYZER (Available for all computers) **Price: $19.95 Cassette/$23.95 Diskette**
Use this program to examine the frequency spectra of limited duration signals. The program features automatic scaling and plotting of the input data and results. Practical applications include the analysis of complicated patterns in such fields as electronics, communications and business.

TFA (Transfer Function Analyzer) **Price: $19.95 Cassette/$23.95 Diskette**
This is a special software package which may be used to evaluate the transfer functions of systems such as hi-fi amplifiers and filters by examining their response to pulsed inputs. TFA is a major modification of FOURIER ANALYZER and contains an engineering-oriented decibel versus log-frequency plot as well as data editing features. Whereas FOURIER ANALYZER is designed for educational and scientific use, TFA is an engineering tool. Available for all computers.

HARMONIC ANALYZER (Available for all computers) **Price: $24.95 Cassette/$28.95 Diskette**
HARMONIC ANALYZER was designed for the spectrum analysis of repetitive waveforms. Features include data file generation, editing and storage/retrieval as well as data and spectrum plotting. One particularly unique facility is that the input data need not be equally spaced or in order. The original data is sorted and a cubic spline interpolation is used to create the data file required by the FFT algorithm.

FOURIER ANALYZER, TFA and HARMONIC ANALYZER may be purchased together for a combined price of $49.95 (three cassettes) and $59.95 (three diskettes).

REGRESSION I (Available for all computers) **Price: $19.95 Cassette/$23.95 Diskette**
REGRESSION I is a unique and exceptionally versatile one-dimensional least squares "polynomial" curve fitting program. Features include very high accuracy; an automatic degree determination option; an extensive internal library of fitting functions; data editing; automatic data and curve plotting; a statistical analysis (eg: standard deviation, correlation coefficient, etc.) and much more. In addition, new fits may be tried without reentering the data. REGRESSION I is certainly the cornerstone program in any data analysis software library.

REGRESSION II (PARAFIT) (Available for all computers) **Price: $19.95 Cassette/$23.95 Diskette**
PARAFIT is designed to handle those cases in which the parameters are imbedded (possibly nonlinearly) in the fitting function. The user simply inserts the functional form, including the parameters (A(1), A(2), etc.) as one or more BASIC statement lines. Data and results may be manipulated and plotted as with REGRESSION I. Use REGRESSION I for polynomial fitting, and PARAFIT for those complicated functions.

MULTILINEAR REGRESSION (MLR) (Available for all computers) **Price: $24.95 Cassette/$28.95 Diskette**
MLR is a professional software package for analyzing data sets containing two or more linearly independent variables. Besides performing the basic regression calculation, this program also provides easy to use data entry, storage, retrieval and editing functions. In addition, the user may interrogate the solution by supplying values for the independent variables. The number of variables and data size is limited only by the available memory.

REGRESSION I, II and MULTILINEAR REGRESSION may be purchased together for $51.95 (three cassettes) or $63.95 (three diskettes).

ANOVA (Not available for PET/CBM) **Price: $39.95 Cassette/$43.95 Diskette**
In the past the ANOVA (analysis of variance) procedure has been limited to the large mainframe computers. Now DYNACOMP has brought the power of this method to small systems. For those conversant with ANOVA, the DYNACOMP software package includes the 1-way, 2-way and N-way procedures. Also provided are the Yates 2^{K-P} factorial designs. For those unfamiliar with ANOVA, do not worry. The accompanying documentation was written in a tutorial fashion (by a professor in the subject) and serves as an excellent introduction to the subject. Accompanying ANOVA is a support program for building the data base. Included are several convenient features including data editing, deleting and appending.

BASIC SCIENTIFIC SUBROUTINES, Volumes 1 and 2 (Not available for Atari)
DYNACOMP is the exclusive distributor for the software keyed to the popular texts *BASIC SCIENTIFIC SUBROUTINES, Volumes 1 and 2* by F. Ruckdeschel (see advertisements in BYTE magazine). These subroutines have been assembled according to chapter. Included with each collection is a menu program which selects and demonstrates each subroutine.

Volume 1

Collection #1:	Chapters 2 and 3 - Data and function plotting; complex variables and functions.
Collection #2:	Chapter 4 - Extended matrix and vector operations.
Collection #3:	Chapters 5 and 6 - Random number generators (Poisson, Gaussian, etc.); series approximations.

Price per collection: $14.95 Cassette/$18.95 Diskette

All three collections are available for $39.95 (three cassettes) and $49.95 (three diskettes).

Volume 2

Collection #1:	Chapter 1 - Linear, polynomial, multidimensional, parametric least squares.
Collection #2:	Chapter 2 - Series approximation techniques (economization, inversion, reversion, shifting, etc.).
Collection #3:	Chapter 3 - Functional approximations by iteration and recursion.
Collection #4:	Chapter 4 - CORDIC approximations to trigonometric, hyperbolic, exponential and logarithmic functions.
Collection #5:	Chapter 5 - Table interpolation, differentiation and integration (Newton, LaGrange, splines).
Collection #6:	Chapter 6 - Methods for finding the real roots of functions.
Collection #7:	Chapter 7 - Methods for finding the complex roots of functions.
Collection #8:	Chapter 8 - Optimization by steepest descent.

Price per collection: $14.95 Cassette/$18.95 Diskette

All eight collections are available for $99.95 (eight cassettes) and $129.95 (eight diskettes).
Because the texts are a vital part of the documentation, *BASIC SCIENTIFIC SUBROUTINES, Volumes 1 and 2* are available from DYNACOMP:

BASIC SCIENTIFIC SUBROUTINES, Vol 1 (319 pages): $19.95 + 75¢ postage
BASIC SCIENTIFIC SUBROUTINES, Vol 2 (790 pages): $23.95 + $1.50 postage
See reviews in KILOBAUD and Dr. Dobbs.

ROOTS (Available for all computers) **Price $10.95 Cassette/$14.95 Diskette**
In a nutshell, ROOTS simultaneously determines all the zeroes of a polynomial having real coefficients. There is no limit on the degree of the polynomial, and because the procedure is iterative, the accuracy is generally very good. No initial guesses are required as input, and the calculated roots are substituted back into the polynomial and the residuals displayed.

ACTIVE CIRCUIT ANALYSIS (ACAP) (48K Apple only) **Price: $25.95 Cassette/$29.95 Diskette**
ACAP is the analog circuit designer's answer to LOGIC SIMULATOR. With ACAP you may analyze the response of an active or passive component circuit (e.g., a transistor amplifier, band pass filter, etc.). The circuit may be probed at equal steps in frequency, and the resulting complex (i.e., real and imaginary) voltages at each component juncture examined. By plotting the magnitude of these voltages, the frequency response of a filter or amplifier may be completely determined with respect to both amplitude and phase. In addition, ACAP prints a statistical analysis of the range of voltage responses which result from tolerance variations in the components. ACAP is easy to learn and use. Simply describe the circuit in terms of the elements and their placement, and execute. Circuit descriptions may be saved onto cassette or diskette to be recalled at a later time for execution or editing. ACAP should be part of every circuit designer's program library.

LOGIC SIMULATOR (Apple only; 48K RAM) **Price: $24.95 Cassette/$28.95 Diskette**
With LOGIC SIMULATOR you may easily test your complicated digital logic design with respect to given set of inputs to determine how well the circuit will operate. The elements which may be simulated include multiple input AND, OR, NOR, EXOR, EXNOR and NAND gates, as well as inverters, J-K and D flip-flops, and one-shots. The response of the system is available every clock cycle. Inputs may be clocked in with varying clock cycle lengths/displacements and delays may be introduced to probe for glitches and race conditions. At the user's option, a timing diagram for any given set of nodes may be plotted using HIRES graphics. Save your breadboarding until the circuit is checked by LOGIC SIMULATOR.

ORDERING INFORMATION

All orders are processed and shipped within 48 hours. Please enclose payment with order and include the appropriate computer information. If paying by VISA or Master Card, include all numbers on card.

Shipping and Handling Charges
Within North America: Add $1.50
Outside North America: Add 10% (Air Mail)

Delivery
All orders (excluding books) are sent First Class.

Quantity Discounts
Deduct 10% when ordering 3 or more programs. Dealer discount schedules are available upon request.

8" CP/M Disks
Add $2.50 to the listed diskette price for each 8" floppy disk (IBM soft sectored CP/M format). Programs run under Microsoft MBASIC or BASIC-80.

5¼" CP/M Disks
All software available on 8" CP/M disks is also available on 5¼" disks, North Star format.

Ask for **DYNACOMP** programs at your local software dealer. Write for detailed descriptions of these and other programs from **DYNACOMP**.

DYNACOMP, Inc. (Dept. C)
1427 Monroe Avenue
Rochester, New York 14618
24 hour order phone: (716)442-8731 recording
Office phone (9AM-5PM EST): (716)442-8960

VISA

MasterCard

New York State residents please add 7% NYS sales tax.

How Will the New Tax Law Affect Computer Owners?

Vernon K. Jacobs

Should you buy your first (or next) computer this year or next? Should you lease or buy? Are there any other areas of the new tax law that might affect those who own or are thinking of owning a computer?

There are at least 109 specific provisions in the "Economic Recovery Tax Act of 1981," and it will be months (perhaps years) before the impact of all the provisions is evaluated. It's almost certain that we will have another tax bill early in 1982 to correct the inevitable technical errors and flaws in this hastily drafted and complex set of tax law changes. Nevertheless, here is a brief summary of some of the provisions of the new tax law that should be of specific concern to computer owners and lessees.

Full Write Off For Small Computers

One of the provisions of the new tax law permits businesses to deduct the first $5,000 of business equipment acquired in 1982 and 1983, the first $7,500 of purchases in 1984 and 1985 and the first $10,000 of purchases after 1985. This means that many small computers could be fully expensed in the year acquired. No investment credit would be allowed on such purchases but the immediate write off would usually be better.

If the cost of the computer exceeds the deductible amount, the excess would be eligible for the new depreciation method. This full write off provision is not available for investors. It is only available if the equipment is to be used in a trade or business.

New Depreciation Rules

If you purchased a computer in 1981, the 100% write off won't be available, but the new method of depreciation (called the "Asset Cost Recovery System") does apply to 1981 equipment purchases.

Under the new method, computers will be depreciated over a five-year period using specific rates for each of the five years. (If computers can be classed as research and development equipment, they can be depreciated over a three-year period.)

For five-year class equipment purchased in 1981 through 1984, the first year's depreciation will be 15% of the cost. The second year's depreciation will be 22% of the cost and the rate will be 21% in each of the next three years. The entire cost will be deducted over the five-year period.

By contrast, the prior law permitted a computer owner to write off up to 40% of the cost in the first year if the equipment was placed in service before July first. An additional 24% of the cost would be written off in the second year, 14.4% in the third year and 10.8% in the fourth and fifth years. This assumes a five year life, which has been typical for computer owners. Consequently, owners of larger and more expensive computers won't fare as well under the new law as under the old, but owners of personal computers will be better off—assuming no other equipment purchases in the year.

If the tax deductions are not available because of other tax deductions or business losses, computer owners will be able to elect to write the equipment off over a 12-year or a 25-year period using a straight line method of depreciation. However, the choice of the slower method is mandatory for each year's purchases, i.e. you can't change your mind after a year or two.

The main reason to use a slow method of depreciation is to avoid the possible loss of deductions during a prolonged start up period due to the existing time limit on offsetting losses of one year against profits of future years. The new law provides substantial relief in this area, which may make the slower depreciation method unnecessary. Previously, business losses could be carried forward for seven years, but the new law extends this to 15 years, retroactive to 1976.

Investment Tax Credit

Computer buyers will realize a small increase in the amount of available investment tax credit for purchasing a computer. Under current law, equipment with a five-year useful life is eligible for 2/3 of the full 10% tax credit. Equipment with a five-year life will now be qualified to claim the full 10% tax credit for equipment that is depreciated over a period of five or more years.

If the equipment will have a three-year useful life (autos, trucks and certain R & D equipment), the tax credit will be 6% of the cost of the property rather than 10%. These new tax credit rules took effect in 1981, and include property that was acquired before the law was passed on August 13, 1981.

There was no specific change relative to claiming the tax credit on the full cost of a system that included both hardware and software. However, if the tax credit is claimed on the software because the price is combined with the hardware, then the buyer must depreciate the software with the hardware. If the software is purchased separately, and is licensed rather than purchased, then the full software cost can be deducted in the year of acquisition.

Defining Leases

Taxpayers and the IRS have been arguing for years about whether a lease is really a lease or just a method of financing an equipment purchase. The new tax law attempts to simplify some of the complex rules that have cropped up in this area. Basically, the parties must agree that the transaction is a lease and the lessee must not acquire ownership of the property at any time during the lease. The lessor must be a corporation and must have an investment of at least 10% that is "at risk" in the investment. Generally, the property must be new property. ☐

Reprinted with permission from the September, 1981 issue of *The Financial Systems Report,* Volume 2.09. Copyright 1981, Vernon K. Jacobs. A sample copy can be obtained for $3.00 from Syntax Corporation, Box 8137-P, Prairie Village, KS 66208.

Why use their flexible discs:

Athana, BASF, Control Data, Dysan, IBM, Maxell, Nashua, Scotch, Shugart, Syncom, 3M, Verbatim or Wabash

when you could be using

MEMOREX

for as low as $1.94 each?

Find the flexible disc you're now using on our cross reference list... then write down the equivalent Memorex part number you should be ordering.

Product Family	Product Description	Memorex Part Number (3201-)	CE quant. 100 price per disc ($)	Athana	BASF	Dysan	IBM	Maxell	Nashua	Scotch 3M	Shugart	Syncom	Verbatim	Wabash	Control Data
Flexible Disc 1s Single-Headed Drives Single-Density Media	IBM Compatible (128 B/S, 26 Sectors)	3060	1.99	473071	53428	800506	2305830	FD1-128	FD-1	740-0	S/A 100	15002	FD34-9000	F111111X	421602
	IBM Compatible (128 B/S, 26 Sectors) w/ W P N	3062	2.04	–	–	–	–	–	–	740-0	–	–	FD34-9000	–	–
	IBM Compatible (128 B/S, 26 Sectors) w/ W P N & Hub Ring	3064	2.39	–	–	–	–	–	–	–	–	–	FD34-9000	–	–
	IBM Compatible (128 B/S, 26 Sectors) REVERSIBLE	1729	3.19	473072	54431	–	–	–	FD-2	740/2-0	–	15150	FF34-9000	F171111X	–
	IBM System 6 Compatible	3066	2.04	473077	54561	800509	1669959		–	740-0 056	–	15003	FD60-9000	F116111X	–
	IBM Compatible (256 B/S, 15 Sectors)	3109	1.99	473073	–	800584	2305845	–	–	740-3600	–	15005	FD36-9000	F112111X	–
	IBM Compatible (512 B/S, 8 Sectors)	3110	1.99	473074	–	800585	1669954	–	–	–	–	15004	FD60-9000	F113111X	–
	Shugart Compatible, 32 Hard Sector	3015	1.99	470901	53802	101/1	–	FH1-32	FD-132	740-32	S/A-101	15025	FD32-9000	–	421322
	Wang Compatible, 32 Hard Sector w/Hub Ring	3087	2.49	–	54491	–	–	–	–	740-32RH	–	–	–	F37A411X	–
	CPT 8000 Compatible	3045	2.69	–	–	–	–	–	–	–	–	15226	–	–	–
Flexible Disc 1d Single-Headed Drives Double-Density Media	IBM Compatible (128 B/S, 26 Sectors)	3090	2.69	474071	54568	3740/1D	–	FD1-128/M2100	FD-1D	741-0	–	–	FD34-8000	F131111X	423002
	Soft Sector (128 B/S, 26 Sectors) REVERSIBLE	3093	3.69	–	–	–	–	–	–	–	–	–	–	–	–
	Shugart Compatible, 32 Hard Sector	3091	2.69	470801	54596	101/1D	–	FH1-32D	–	741-32	S/A-103	15075	FD32-8000	F33A411X	423322
	Wang Compatible, 32 Hard Sector w/Hub Ring	3088	3.09	–	–	–	–	–	–	–	–	–	–	–	–
Flexible Disc 2s Double-Headed Drives Single-Density Media	Soft Sector (128 B/S, 26 Sectors)	3113	3.09	–	54428	800814	1766870	–	–	–	S/A-150	15153	FD10-4026	F121111X	–
	Soft Sector (256 B/S, 15 Sectors)	3106	3.09	473477	54226	800815	2736700	FD2-256D	–	742-0	–	15154	FD10-4015	F122111X	424612
Flexible Disc 2d Double-Headed Drives Double-Density Media	Soft Sector (Unformatted)	3102	3.09	473485	–	DY150	–	FD2-XDM	FD-2D	743-0	–	15103	DD34-4001	–	425002
	Soft Sector (128 B/S, 26 Sectors)	3115	3.09	–	–	–	–	–	–	–	S/A-150	–	–	–	–
	Soft Sector (256 B/S, 26 Sectors)	3103	3.09	473471	54325	800817	1766872	FD2-256D	–	743-0/256	–	15101	DD34-4026	F144111X	425602
	Soft Sector (512 B/S, 15 Sectors)	3114	3.09	473472	54479	800818	1669044	–	–	743-0/512	–	15100	DD34-4015	F145111X	425612
	Soft Sector (1024 B/S, 8 Sectors)	3104	3.09	473473	54485	800819	1669045	–	–	743-0/1024	–	15102	DD34-4008	F147111X	425622
	32 Hard Sector	3105	3.09	470851	–	101/2D	–	FH2-32D	–	743-32	S/A-151	15125	DD32-4000	F34A411X	425322
	Burroughs B-80 Compatible, 32 Hard Sector	3092	3.09	–	–	–	–	–	–	–	–	–	–	F34A611X	–
	Soft Sector (1024 B/S, 8 Sectors) w/ Hub Ring	3116	3.49	–	–	–	–	–	–	–	–	–	–	–	–
	Shugart Compatible, 32 Hard Sector	3181	3.39	–	–	–	–	–	–	–	–	–	DD32-4000	–	–
Flexible Disc FD Memorex 651 or Equiv Drive Compatible	FD VI (Vinyl Jacket)	30712003	2.69	470651	–	FDIV	–	–	FD-165	511-0	–	15026	FD65-1000	F61A111X	–
Mini Flexible Disc 1s 5¼" Single-Headed Drives Single-Density Media	Soft Sector (Unformatted)	3401	1.94	475001	54256	104/1	–	MD1	MD 1	744-0	S/A-104	15300	MD525-01	M11A211X	441002
	10 Hard Sector	3403	1.94	475010	54257	107/1	–	–	MD 110	744-10	S/A-107	15325	MD525-10	M41A211X	441102
	16 Hard Sector	3405	1.94	475016	54258	105/1	–	MH1	MD 116	744-16	S/A-105	15326	MD525-16	M51A211X	441162
	Soft Sector (Unformatted) w/Hub Ring	3431	2.14	–	–	–	–	–	–	–	–	–	MD525-01	–	–
	10 Hard Sector, w/Hub Ring	3433	2.14	–	–	–	–	–	–	–	–	–	MD525-10	–	–
	16 Hard Sector, w/Hub Ring	3435	2.14	–	–	–	–	–	–	–	–	–	MD525-16	–	–
Mini Flexible Disc 1d 5¼" Single-Headed Drives Double-Density Media	Soft Sector (Unformatted)	3417	2.14	–	54646	104/1D	–	–	–	–	–	–	MD525-01	–	–
	10 Hard Sector	3418	2.14	–	54649	107/1D	–	–	–	–	–	–	MD525-10	–	–
	16 Hard Sector	3419	2.14	–	54652	105/1D	–	–	–	–	–	–	MD525-16	–	–
	Soft Sector (Unformatted) w/Hub Ring	3481	2.34	–	–	–	–	–	–	–	–	–	MD525-01	–	–
	10 Hard Sector w/Hub Ring	3483	2.34	–	–	–	–	–	–	–	–	–	MD525-10	–	–
	16 Hard Sector w/Hub Ring	3485	2.34	–	–	–	–	–	–	–	–	–	MD525-16	–	–
Mini Flexible Disc 2d 5¼" Double-Headed Drives Double Density Media	Soft Sector (Unformatted)	3421	2.59	–	54624	104/2D	–	–	–	–	S/A-154	–	MD550-01	–	–
	10 Hard Sector	3423	2.59	–	54627	107/2D	–	–	–	–	S/A-157	–	MD550-10	–	–
	16 Hard Sector	3425	2.59	–	54630	105/2D	–	–	–	–	S/A-155	–	MD550-16	–	–
	Soft Sector (Unformatted) w/Hub Ring	3491	2.79	–	–	–	–	–	–	–	–	–	MD550-01	–	–
	10 Hard Sector w/Hub Ring	3493	2.79	–	–	–	–	–	–	–	–	–	MD550-10	–	–
	16 Hard Sector w/Hub Ring	3495	2.79	–	–	–	–	–	–	–	–	–	MD550-16	–	–

Memorex Flexible Discs...The Ultimate in Memory Excellence

Quality

Memorex means quality products that you can depend on. Quality control at Memorex means starting with the best materials available. Continual surveillance throughout the entire manufacturing process. The benefit of Memorex's years of experience in magnetic media production, resulting, for instance, in proprietary coating formulations. The most sophisticated testing procedures you'll find anywhere in the business.

100 Percent Error Free

Each and every Memorex Flexible Disc is certified to be 100 percent error free. *Each* track of *each* flexible disc is tested, individually, to Memorex's stringent standards of excellence. They test signal amplitude, resolution, low-pass modulation, overwrite, missing pulse error and extra pulse error. They are torque-tested, and competitively tested on drives available from almost every major drive manufacturer in the industry including drives that Memorex manufacturers. Rigid quality audits are built into every step of the manufacturing process and stringent testing result in a standard of excellence that assures you, our customer, of a quality product designed for increased data reliability and consistent top performance.

Customer-Oriented Packaging

Memorex's commitment to excellence does not stop with a quality product. They are proud of their flexible discs and they package them with pride. Both their packaging and their labeling have been designed with your ease of identification and use in mind. The desk-top box containing ten discs is convenient for filing and storage. Both box labels and jacket labels provide full information on compatibility, density, sectoring, and record length. Envelopes with multi-language care and handling instructions and color-coded removable labels are included. A write-protect feature is available to provide data security.

Full One Year Warranty — Your Assurance of Quality

Memorex Flexible Discs will be replaced by Memorex if they are found to be defective in materials or workmanship within one year of the date of purchase. Other than replacement, Memorex will not be responsible for any damages or losses (including consequential damages) caused by the use of Memorex Flexible Discs.

Quantity Discounts Available

Memorex Flexible Discs are packed 10 discs to a carton and 10 cartons to a case. Please order only in increments of 100 units for quantity 100 pricing. We are also willing to accommodate your smaller orders. Quantities less than 100 units are available in increments of 10 units at a 10% surcharge. **Quantity discounts** are also available. Order 500 or more discs at the same time and deduct 1%; 1,000 or more saves you 2%; 2,000 or more saves you 3%; 5,000 or more saves you 4%; 10,000 or more saves you 5%; 25,000 or more saves you 6%; 50,000 or more saves you 7% and 100,000 or more discs earns you an 8% discount off our super low quantity 100 price. Almost all Memorex Flexible Discs are immediately available from **CE**. Our warehouse facilities are equipped to help us get you the quality product you need, when you need it. If you need further assistance to find the flexible disc that's right for you, call the Memorex compatibility hotline. Dial 800-538-8080 and ask for the *flexible disc hotline* extension 0997. In California dial 800-672-3525 extension 0997.

Buy with Confidence

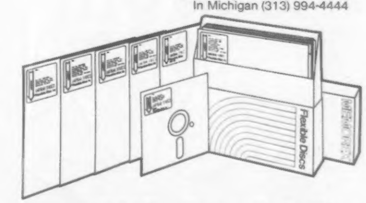
To get the fastest delivery from **CE** of your Memorex Flexible Discs, send or phone your order directly to our Computer Products Division. Be sure to calculate your price using the **CE** prices in this ad. Michigan residents please add 4% sales tax. Written purchase orders are accepted from approved government agencies and most well rated firms at a 10% surcharge for net 10 billing. All sales are subject to availability, acceptance and verification. All sales are final. Prices, terms and specifications are subject to change without notice. Out of stock items will be placed on backorder automatically unless **CE** is instructed differently. Minimum order $50.00. International orders are invited with a $20.00 surcharge for special handling in addition to shipping charges. All shipments are F.O.B. Ann Arbor, Michigan. No COD's please. Non-certified and foreign checks require bank clearance.

Mail orders to: **Communications Electronics**, Box 1002, Ann Arbor, Michigan 48106 U.S.A. Add $8.00 per case or partial-case of 100 8-inch discs or $6.00 per case of 100 5¼-inch mini-discs for U.P.S. *ground* shipping and handling in the continental U.S.A. If you have a Master Card or Visa card, you may call anytime and place a credit card order. **Order toll-free** in the United States. Call anytime 800-521-4414. If you are outside the U.S. or in Michigan, dial 313-994-4444. **Dealer inquiries invited**. All order lines at **Communications Electronics** are staffed 24 hours.

Copyright ©1981 Communications Electronics™

MEMBER
DIRECT MAIL MARKETING ASSOCIATION
CODE OF ETHICS
VISA
MasterCard

Order Toll-Free!
(800) 521-4414
In Michigan (313) 994-4444



For Data Reliability—Memorex Flexible Discs

COMMUNICATIONS ELECTRONICS™

Computer Products Division

854 Phoenix ☐ Box 1002 ☐ Ann Arbor, Michigan 48106 U.S.A.
Call TOLL-FREE (800) 521-4414 or outside U.S.A. (313) 994-4444

CIRCLE 198 ON READER SERVICE CARD

tices...notices...notic

MECC NEWS

The Minnesota Educational Computing Consortium (MECC), which provides support services for educational computing for 30 college campuses and 433 school districts in the state, has signed an agreement that is expected to lead to the purchase of approximately 750 personal computer systems from Atari, Inc., over the next year.

The agreement specifies Atari 400 computers with Atari Basic cartridges, Atari 810 disk drives and joystick controllers. At retail, each system would be priced at approximately $1,100.

As part of the agreement, MECC will also convert about 75 of its educational software programs (kindergarten through 12th grade) for use on Atari computers. The programs and accompanying courseware will be available from MECC.

It is expected that Atari versions of the MECC software will be available from Creative Computing Software, which currently distributes the programs for the Apple.

Atari Software Acquisition Center

Independent software developer works on converting his software, originally designed to work on another manufacturer's computer, to a format useable on Atari Home Computers.

The first Atari Regional Software Acquisition Center has opened its doors in Sunnyvale, CA.

The center is designed to provide a place where qualified software developers can work with Atari equipment, have access to technical reference materials and be able to work with a staff of trained people who can answer their questions about Atari computers.

The 4,000 square-foot center houses the administration and duplication facilities for the Atari Program Exchange (APX), which makes software written by users of Atari computers available through a quarterly catalog. More than 57 different programs are now offered through the catalog. In addition, it houses a facility for the conversion of programs written for other computers to a format that will work on Atari computers.

Corrections

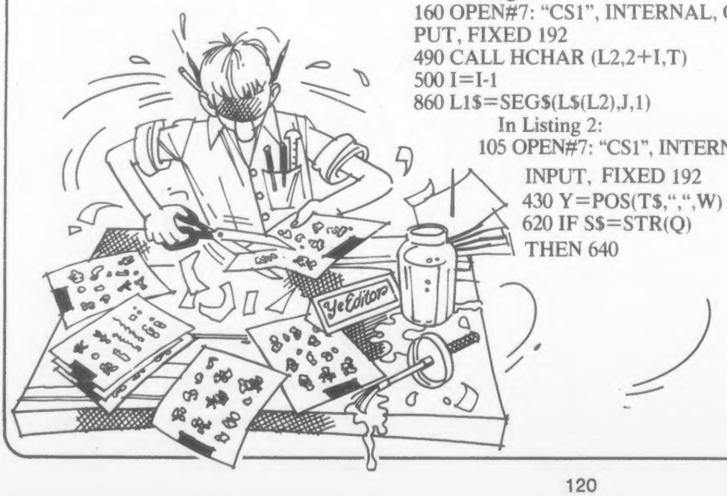
We've received a few corrections for "The Computer Tutor," from the October issue.

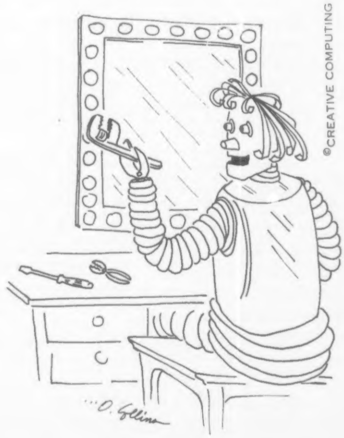
In Listing 1:

```
160 OPEN#7: "CS1", INTERNAL, OUT-
PUT, FIXED 192
490 CALL HCHAR (L2,2+I,T)
500 I=I-1
860 L1$=SEG$(L$(L2),J,1)
```

In Listing 2:

```
105 OPEN#7: "CS1", INTERNAL,
    INPUT, FIXED 192
430 Y=POS(T$,",",W)
620 IF S$=STR(Q)
    THEN 640
```



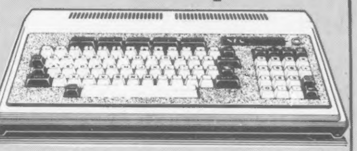


"...Just a moment, dear—I'm fixing my face."

consumer computers Mail Order DISCOUNTS

ORDER TOLL-FREE

NEC
Microcomputer



PC-8001A 32K Computer	CALL
PC-8012A I/O Unit w/32K RAM	CALL
PC-8013A Dual Mini-Disk Drive Unit	CALL
PC-8001 Multi Cardware (FDI/O & 32K)	CALL
CP/M 2.2 Operating System for NEC	129
WordStar configured for NEC	299
SuperCalc configured for NEC	279
NEC Wordprocessor & Accounting Software	CALL

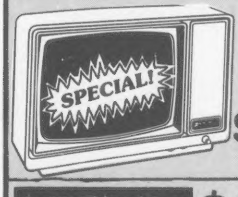
Many more software packages and languages; (Pascal, Fortran, Cobol, etc) are available configured for the NEC 8001A Computer.
Please call or write for a product price list.

ATARI 800 16K
$749

Atari 400 w/16K	349
410 Program Recorder	65
810 Disk Drive	449
825 80 col. 7x8 Dot matrix impact printer	699
822 40 col. Quiet Thermal Printer	349
850 Interface Module	159
Atari 16K Ram Module	69
Axlon Ramcram 32K Module	189

Video Monitors

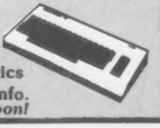
Amdek/Leedex Video 100 12" B&W	155
Amdek/Leedex Video 100G 12" Green Phospher	179
Amdek (Hitachi) 13" Color w/audio output	389
NEC 12" Green Phospher Display JB-1201M	CALL
NEC 12" Lo-Res Color Display	CALL
NEC 12" Hi-Res RGB Color Display	CALL
Sanyo 9" B&W Display	185
Sanyo 9" Green Phospher Display	CALL
Sanyo 12" B&W Display	269
Sanyo 12" Green Phospher Display	285
Sanyo 13" Color Display	449
Zenith 12" Green Phospher Display ZVM-121	149



ZENITH 12" GREEN
$149

VIC20™ $259

Personal Computer
Color • Sound • Graphics
Call or write for more info.
Disk drives available soon!



apple computer
Authorized Dealer

APPLE II PLUS

16K	*NOW*	$1025
48K	*NOW*	$1089
64K*	*NOW*	$1199

*48K Apple with 16K RamBoard

APPLE DISK DRIVES
$439

w/controller and DOS 3.3 **$499**

Apple Cards and Hardware

Language System w/Pascal & BASICS	379
Silentype Printer w/Interface card	349
Hayes Micromodem II	299
Novation Apple-Cat	339
Videx Videoterm 80 column card	269
Videx Keyboard Enhancer	115
Z-80 Softcard by Microsoft	299
16 K RamCard by Microsoft	169
CPS Multi-function card	189

Software for the Apple

VisiCalc version 3.3	159
VisiFile (NEW data base manager)	199
VisiTrend/VisiPlot	219
DB Master	169
WordStar (Apple 80 col. version)	249
Dow Jones Portfolio Evaluator	45
Apple Post	45
Apple Writer	65
Dow Jones News & Quotes Reporter	85
Apple Plot	60
Tax Preparer	99
Real Estate Analyzer	129

16K RAMBOARD *by ConComp*
for Apple II Computers

FOR ONLY **$129.95**

AVAILABLE NOW

S-100
California Computer Systems

Floppy Disk Controller	**$369**
64K Dynamic Ram Board, 200ns	**$499**
Z-80 CPU board w/monitor ROM	**$269**
16K Static memory board, 200ns	369
32K Static memory board, 200ns	599
S-100 12 Slot Mainframe	475
4-Port Serial Interface	299
2-Port Serial/2-Port Parallel Interface	299
4-Port Parallel Interface	229

Printers

Silentype
w/Apple II interface
$349

Epson
MX-80 or
MX-80 FT
CALL

Anadex 9501 w/2K Buffer	1349
C. Itoh Starwriter 25 CPS daisywheel	1449
C. Itoh Starwriter 45 CPS daisywheel	1649
Epson MX-70	CALL
Epson MX-80 & MX-80 F/T	CALL
Epson MX-100	CALL
NEC 8023 Impact Dot Matrix	695
NEC Spinwriters (Latest models)	CALL
Paper Tiger IDS-445G w/graphics	699
Paper Tiger IDS-460G w/graphics	949
Paper Tiger IDS-560G w/graphics	1249
Silentype Printer w/Apple interface	349
Qume Sprint Daisywheels (Latest models)	CALL

ORDER TOLL FREE
800-854-6654

In California and outside continental U.S.
(714) 698-8088
Telex 695-000 Beta CCMO

Send Orders To:

Ordering information: Phone orders using VISA, MASTERCARD, AMERICAN EXPRESS, DINER'S CLUB, CARTE BLANCHE, bank wire transfer, cashier's or certified check, money order, or personal check (allow ten days to clear). Unless prepaid with cash, please add 5% for shipping, handling and insurance. (minimum 5.00). California residents add 6% sales tax. We accept CODs. OEM's, Institutions and corporations please send for a written quotation. All equipment is subject to price change and availability without notice. All equipment is new and complete with manufacturer's warranty (usually 90 days). Showroom prices may differ from mail order prices.

consumer
computers **Mail Order**

8314 Parkway Drive
La Mesa, Calif. 92041

CIRCLE 140 ON READER SERVICE CARD

DSK Keyboard for the Apple

Patrick Niesink

It seems that more and more people, particularly computer owners, are becoming aware of the utter cruelty of the keyboard arrangement, commonly referred to as QWERTY, currently in use on most typewriters and computers. A superior arrangement, the Dvorak Simplified Keyboard, which was developed by August Dvorak in 1936, minimizes finger distances travelled and thus greatly improves typing speed and accuracy.

When I bought my typewriter, I surrendered to QWERTY, balking at the thought of breaking off and re-soldering the key slugs. However, when I purchased my Apple, I saw an ideal opportunity to reap the benefits of DSK. To convert the Apple to a DSK computer, we need to change the way both the computer and its user interpret the keyboard.

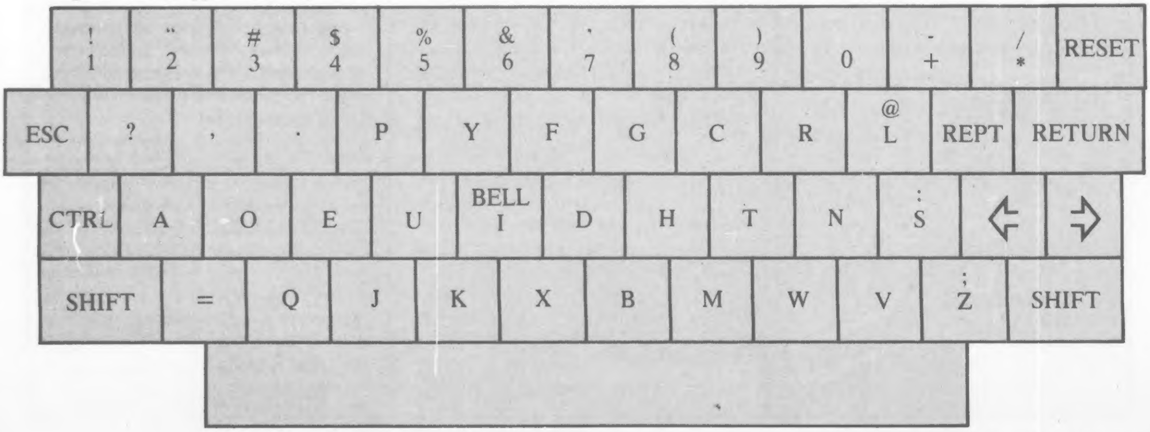
To make the computer believe that you are typing on a DSK keyboard, you need to supply it with a list of ASCII code values known as a "translate table," and since the 6502 chip has no translate instruction, you will also need a short machine language translating program. The translate table tells the computer which character you *want* to type (DSK keyboard) when supplied with a character typed on the QWERTY keyboard. For example, when you press the "Q" key on the DSK arrangement, you are actually pressing the "X" key. The entry in the translate table which corresponds to the "X" is the ASCII code for a "Q."

Since you will want to make this table as small as possible, you can omit the keys which are not rearranged and compensate by making the translating program a bit more complex. Now you must decide which characters to relocate and which to leave alone. Clearly, you cannot tamper with the control codes, since if you did, the next time you pressed the backspace or forward arrow keys, you would get a nasty surprise. It might seem like a better idea to move CTRL-B along with the "B" key to avoid confusion. For example, if control codes are not relocated, CTRL-C becomes CTRL-J, thus making your Basic manual somewhat obsolete. However, you can always write short notes in your manuals with the new control codes.

Mr. Dvorak's suggested layout for numeric keys seems more of a hindrance than an aid, so I have not altered the numbers (or their shifted characters) in my implementation. This leaves the letters A-Z and the colon, semicolon, slash, question mark, period, comma, hyphen, asterisk, less than, greater than, plus sign, and equal sign. In the ASCII code table, the asterisk, comma, hyphen, period, slash and plus sign occur directly before the numbers and the others are nicely sandwiched between the numbers and the letters. Thus, if you include the numbers in the translation table, you may have wasted ten bytes, but the translating program becomes less complex.

Patrick Niesink, 356 Lindsay St., Winnipeg, Manitoba, Canada R3N 1H3.

Figure 1. The Apple DSK Keyboard.



Introducing:

Smart
Ware
TM
LISP 1.7 & 2.0

Introducing
LISP. The language
that can think for itself.

With SmartWare, your microcomputer possesses intelligence. Solves problems like never before. Actually can learn from its mistakes. And educates itself in much the same way your brain operates. It's a new concept in the way information is handled in microcomputers.

We appropriately called our version of LISP, SmartWare. Because it's as limitless as the human imagination, mind, memory.

An advanced, high-level language, LISP was first developed for use in artificial intelligence on large computers. And now, LISP is available from Datasoft for use on the Apple II and Atari Computers.

Store multiple programs in memory. It can take it. Program other languages into LISP. It's no problem. Because LISP offers greater capacity and power. And, it's a faster, more streamlined language. For example, just 2 lines in LISP could equal hours of BASIC programming.

The fact: Relational data base capabilities. User and program definability. Pattern-directed invocation language. Uses syntax and data structures upon which esoteric applications may be implemented. Remembers data along with "relationships affecting it." Offers REAL power to micros.

At MIT, they say LISP is the language of the future.

At datasoft, we say, why wait. Ask your local computer dealer for SmartWare. Right now! And turn your computer on to thinking.

SmartWare by
Datasoft Inc.T.M.
COMPUTER SOFTWARE

19519 Business Center Dr., Northridge, CA 91324
(213)701-5161

CIRCLE 266 ON READER SERVICE CARD

InterLISP/65 for ATARI 48K systems $149.^{95}$ & APP-L-ISP 1.7 for Apple II 48K systems $124.^{95}$.

```
     933: * TRANSLATES TO -
     934: + TRANSLATES TO :
     935: , TRANSLATES TO W
     936: - TRANSLATES TO *
     937: . TRANSLATES TO V
     938: / TRANSLATES TO Z
     939: 0 TRANSLATES TO 0
     940: 1 TRANSLATES TO 1
     941: 2 TRANSLATES TO 2
     942: 3 TRANSLATES TO 3
     943: 4 TRANSLATES TO 4
     944: 5 TRANSLATES TO 5
     945: 6 TRANSLATES TO 6
     946: 7 TRANSLATES TO 7
     947: 8 TRANSLATES TO 8
     948: 9 TRANSLATES TO 9
     949: : TRANSLATES TO +
     950: ; TRANSLATES TO S
     951: < TRANSLATES TO <
     952: = TRANSLATES TO /
     953: > TRANSLATES TO >
     954: ? TRANSLATES TO ;
     955: @ TRANSLATES TO @
     956: A TRANSLATES TO A
     957: B TRANSLATES TO X
     958: C TRANSLATES TO J
     959: D TRANSLATES TO E
     960: E TRANSLATES TO .
     961: F TRANSLATES TO U
     962: G TRANSLATES TO I
     963: H TRANSLATES TO D
     964: I TRANSLATES TO C
     965: J TRANSLATES TO H
     966: K TRANSLATES TO T
     967: L TRANSLATES TO N
     968: M TRANSLATES TO M
     969: N TRANSLATES TO B
     970: O TRANSLATES TO R
     971: P TRANSLATES TO L
     972: Q TRANSLATES TO ?
     973: R TRANSLATES TO P
     974: S TRANSLATES TO O
     975: T TRANSLATES TO Y
     976: U TRANSLATES TO G
     977: V TRANSLATES TO K
     978: W TRANSLATES TO ,
     979: X TRANSLATES TO Q
     980: Y TRANSLATES TO F
     981: Z TRANSLATES TO =
```

Figure 2. Contents of Translation Table.

Now all that remains is to decide where on the keyboard to put these 38 characters. Clearly, you can't "double up" characters (one being the shift of the other) on a key such as the QWERTY "Q" key, since shifting the key will not produce a different code. Dvorak's key layout puts four non-letter keys in the places formerly occupied by "Q," "W," "E," and "Z." The comma and the period I have placed as suggested, but I have left less than and greater than where they were. In the suggested place of the slash, I have substituted the question mark, the Basic abbreviation for PRINT. The suggested semicolon-colon key is the equal sign on my computer, since it is also used very frequently in Basic programs.

The arithmetic keys I have placed in the upper right corner, in an order which seems the most logical from a mathematical point of view. Thus simple arithmetic can be performed entirely with the top row and leftmost three keys of the second row. This leaves only the semicolon and the colon. These I have placed above the "Z" and "S" keys, since they were the only places left.

The Translating Program

Now you're ready to write the translating program. The first thing it has to do is call the Apple's KEYIN routine, at location $FD1B. This subroutine returns the ASCII code for the typed character in the Accumulator. Next, you must save the A and X registers in temporary storage locations. I have chosen locations 8 and 9, as they are not used by either Basic, the monitor, or DOS 3.2.

Now you have to make sure that the typed character is one of the relocated ones. Subtracting the value $AA (which is ASCII for "*" with its high bit set) serves two functions: first, if this operation sets the N flag, the character is either a control character or a shifted numeric key; thus you don't want to change it. If the N flag is not set, you need only check that the code is not greater than $DA, which is a "Z."

Now that the Apple understands DSK, all you have to do is change the key caps on the keyboard.

The accumulator now contains a modified ASCII code: 0 for an asterisk, 1 for a plus sign, 2 for a comma, and so on. This means that "Z" has a value of $31, so all you have to do is compare the accumulator to $31. This time if N is *not* set, the character should not be changed. To leave the character unchanged, merely re-load it from location 8 and return. If the N flag *was* set this time, the character must be translated. This is accomplished by using the pre-indexed mode of the "load accumulator" instruction.

First, transfer the current value of the accumulator into the indexing register X. Then, giving the start address of the translation table (mine is at $3A5), load the DSK counterpart of the typed character into the accumulator. What this particular form of LDA does is add the current value of the X register to the specified address, and use the result as the address of the desired byte. Remember that the table starts at *, that is, location $A5 has the ASCII code for the DSK character which replaces the "*" on the QWERTY keyboard.

Now the accumulator contains the translated ASCII value. All you have to do is store this value in location 8, then act as if you don't want to change it, that is, reload the accumulator and X register and return to whatever program called the translation program. Simple, wasn't it?

Implementation

The next problem lies in implementation. The translation table and program can be saved either on tape through the monitor, or, if you have a disk drive, in a binary file. Then, each time you power up, you will have to load in the table program, and set the monitor KSW switch (bytes $38 and $39 if you don't have a disk drive) to the address of the translating program, $3D6 in my implementation.

If you have a disk drive, it's a bit more involved. Not only will you have to set the KSW of DOS, which is 5205 and 5206 bytes past the HIMEM set by DOS 3.2, but you will have to protect resets and Basic IN#0 commands from putting you back in QWERTY.

This can be done in many ways, but the simplest is to zap out the section of DOS 3.2 which resets the KSW switch. The only disadvantage of this is that it invalidates the Basic IN# command and the CTRL-K command of the monitor. If this really bothers you, there are other ways of protecting the DSK, such as wedging a routine before the DOS RESET routine which plugs your translation program into the DOS KSW.

All you have to do, then, is write a Basic program which loads in the binary file, sets the DOS KSW, and clears out the KSW-resetting routine (which runs from 4696 through 4703 bytes past the HIMEM set by DOS). Then store this program as the "hello" program on your disk. This program will only work if it is run before any program which changes HIMEM.

Listing 1. "HELLO" program for disk.

```
10  PRINT "DO YOU WANT DSK OR QWERTY?"
20  PRINT "(ENTER D OR Q):";
30  GET A$: IF A$ = "" THEN 30
40  IF A$ = "Q" OR A$ = "X" THEN  PRINT "Q": PRINT "OK.": GOTO 140
50  REM ALLOW FOR BOTH KEYBORDS (Q OR X, D OR H)
60  IF A$ <  > "D" AND A$ <  > "H" THEN 20
70  PRINT "D"
80  PRINT  CHR$ (4);"BLOAD DSK"
90 HI =  PEEK (115) + 256 *  PEEK (116): REM HIMEM
100  POKE 5205 + HI,214: POKE 5206 + HI,3: REM DOS KSW
110  FOR K = HI + 4696 TO HI + 4703
120  POKE K,234: REM NOP ($EA) IN 'RESET' RTN; PERMITS IN#0 AND RESETS
130  NEXT
135  PRINT "DSK KEYBOARD TRANSLATION INSTALLED."
140  END
```

```
03A5- AD BA D7
03A8- AA D6 DA B0 B1 B2 B3 B4
03B0- B5 B6 B7 B8 B9 AB D3 BC
03B8- AF BE BB C0 C1 D8 CA C5
03C0- AE D5 C9 C4 C3 C8 D4 CE
03C8- CD C2 D2 CC BF D0 CF D9
03D0- C7 CB AC D1 C6 BD
*3D6L

03D6-  20 1B FD  JSR  $FD1B
03D9-  85 08     STA  $08
03DB-  86 09     STX  $09
03DD-  E9 AA     SBC  #$AA
03DF-  30 0A     BMI  $03EB
03E1-  C9 31     CMP  #$31
03E3-  10 06     BPL  $03EB
03E5-  AA        TAX
03E6-  BD A5 03  LDA  $03A5,X
03E9-  85 08     STA  $08
03EB-  A5 08     LDA  $08
03ED-  A6 09     LDX  $09
03EF-  60        RTS
```

Listing 2. Translating table and program.

Now that the Apple understands DSK, all you have to do is exchange the key caps on the keyboard. Placing a pointed instrument underneath a key near the edge, and your finger on the opposite side of the key, lift straight up, applying equal pressure on both sides of the key. If this is the first time you've ever removed the caps, they may be rather stiff. The removal of the first cap should provide enough room to get your finger underneath the rest, thus eliminating the need for the pointed instrument. When you are done, some of the keys will be incorrectly labelled; you can cover them with masking tape and re-label them if you have trouble remembering which keys are which. The whole operation takes about five minutes.

Learning to Type

Now that you have a DSK keyboard, all you have to do is learn to type on it. The first week or so, you will probably find yourself typing keywords as if you still had QWERTY. After a while, though, you will be typing faster than ever. If you have special software which can only be run from a disk boot, you will have to revert to QWERTY every time you want to use it (unless you can figure out a way to get the program onto a regular disk).

If you want to use the Applesoft Chain program, you will have to relocate the translation table and program. Also, if you are an experienced DSK typist, you will have trouble finding keys on a regular keyboard (as if you'd want to). Nevertheless, these drawbacks are minimal when compared to the savings in tedium, wasted time, and sore fingers achieved by using a modern, efficient Dvorak Simplified Keyboard. ☐

The Mean Little Kit

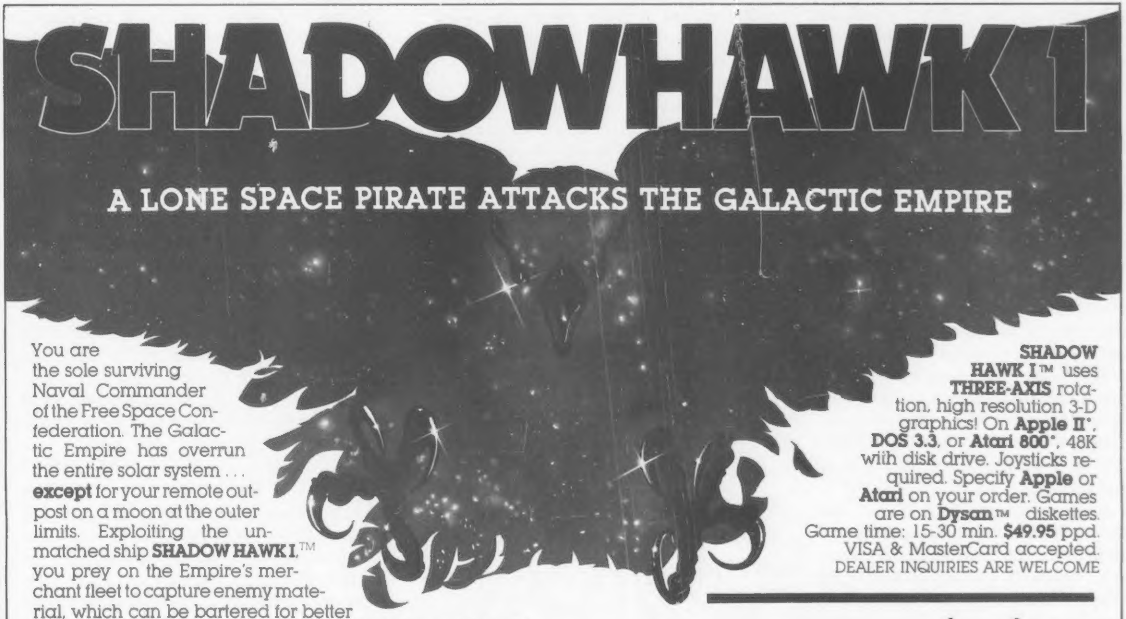
New compact 24-piece kit of electronic tools for engineers, scientists, technicians, students, executives. Includes 7 sizes screwdrivers, adjustable wrench, 2 pair pliers, wire stripper, knife, alignment tool, stainless rule, hex-key set, scissors, 2 flexible files, burnisher, miniature soldering iron, solder aid, coil of solder and desoldering braid. Highest quality padded zipper case, 6 x 9 x 1¾" inside. Satisfaction guaranteed. Send check, company purchase order or charge Visa or Mastercharge. We pay the shipping charges.

JTK-6 Tool Kit.................... $90.00

Free Catalog! Page after page of hard-to-find precision tools. Also contains complete line of tool kits and tool cases. Send for your free copy today!

JENSEN TOOLS INC.
1230 S. PRIEST DR. TEMPE, AZ. 85281

CIRCLE 197 ON READER SERVICE CARD



SHADOWHAWK 1

A LONE SPACE PIRATE ATTACKS THE GALACTIC EMPIRE

You are the sole surviving Naval Commander of the Free Space Confederation. The Galactic Empire has overrun the entire solar system . . . **except** for your remote outpost on a moon at the outer limits. Exploiting the unmatched ship **SHADOW HAWK I**,™ you prey on the Empire's merchant fleet to capture enemy material, which can be bartered for better weaponry, shielding, missiles, etc., for **SHADOW HAWK I.** ™ But the Empire's interceptors, corvettes, lancers, destroyers, and cruisers are probing the galaxy for you. You must evade them and the deadly battle stations throughout. Your skill is measured by nine rankings, up to **STAR LORD.** Warning: You must be very, very good to reach **STAR LORD** rank! Very good indeed!

SHADOW HAWK I™ uses **THREE-AXIS** rotation, high resolution 3-D graphics! On **Apple II***, **DOS 3.3**, or **Atari 800***, 48K with disk drive. Joysticks required. Specify **Apple** or **Atari** on your order. Games are on **Dysan**™ diskettes. Game time: 15-30 min. **$49.95** ppd. VISA & MasterCard accepted. DEALER INQUIRIES ARE WELCOME

107 E. Main #2, Medford, OR 97501
(503) 779-0078

*__Apple II__ and __Atari 800__ are registered trademarks, respectively, of Apple Computer, Inc. and Atari, Inc.

HORIZON SIMULATIONS

CIRCLE 183 ON READER SERVICE CARD

Big Numbers and Small Computers

Mark Zimmermann

```
ππππππππππππππππππ
3.141592653589793238462643383279502884197169
39937510582097494459230781640628620899862803
48253421170679821480865132823066470938446095
50582231725359408128481117450284102701938521
10555964462294895493038196442881097566593344
61284756482337867831652712019091456485669234
60348610454326648213393607260249141273724587
00660631558817488152092096282925409171536436
78925903600113305305488204665213841469519415
11609433057270365759591953092186117381932611
79310511854807446237996274956735188575272489
12279381830119491298336733624406566430860213
94946395224737190702179860943702770539217176
29317675238467481846766940513200056812714526
35608277857713427577896091736371787214684409
01224953430146549585371050792279689258923542
01995611212902196086403441815981362977477130
99605187072113499999983729780499510597317328
16096318595024459455346908302642522308253344
68503526193118817101000313783875288658753320
83814206171776691473035982534904287554687311
59562863882353787593751957781857780532171226
80661300192787661119590921642019893809525720
10654858632788659361533818279682303019520353
01852968995773622599413891249721775283479131
51557485724245415069595082953311686172785588
90750983817546374649393192550604009277016711
39009848824012858361603563707660104710181942
95559619894676783744944825537977472684710404
75346462080466842590694912933136770289891521
04752162056966024058038150193511253382430035
ππππππππππππππππππ
```

Numbers are fascinating entities. In some ways, a number is pure, abstract thought, unsullied by "reality." Consider the decimal number "17": does it exist in nature? Sure, there are collections of things that contain seventeen objects; you may have seventeen pennies in your pocket, or walk up seventeen flights of stairs. But those pennies aren't "17," any more than they are Abraham Lincoln. The number "17" goes far beyond any specific embodiment of it.

Seventeen has properties independent of whether one is considering pennies, or stairs, or stars. In counting upwards, 17 follows 16 and precedes 18. Seventeen is a "prime," that is, it has no factors except itself and 1 among the positive integers. It is possible to construct a seventeen-sided regular polygon using only a compass and a straightedge, just as it's possible to make an equilateral triangle or pentagon. Seventeen is very special, in lots of ways; so are other numbers.

The positive integers 1, 2, 3, . . . are sometimes called "natural numbers," perhaps because at first sight they seem somehow obvious or commonplace. These natural numbers, however, soon lead to subtle and extraordinary results. Notice, for instance, the limitlessness of the series of integers: for any number you care to name, I can find a larger number. We are immediately faced with the mystery of "infinity"—yet we ourselves are finite creatures, on a finite planet in a finite galaxy. (Perhaps the universe is finite too—we don't know.)

Even staying well short of infinity, the natural numbers overwhelm us. Pick a random decimal number a thousand digits long. If every star in the observable universe has a hundred planets, and every planet has a trillion aliens, and every alien is guessing a trillion numbers per second, the odds are very, very long against anybody guessing your number within the age of the universe.

The most important use of Bignum may be to extend one's reach to larger integers, so that new theorems or conjectures may be grasped.

Big numbers form a vast, unexplored territory. It's a territory into which almost anybody with the inclination can venture, a land full of never-before-seen sights and discoveries, waiting to be found. In the exploration of large numbers, to quote IBM, "a small computer can make a big difference." A home computer can speed your journeys and take much of the arithmetical "grunge" away; a machine is also less likely to make a mistake!

I've written a program in Basic, called Bignum, which is an aid in handling big numbers. Bignum imitates a pocket calculator, but with a difference: it can add, subtract, multiply, divide, and raise to a power integers of up to 1024 decimal digits! (The length limitation of 1024 digits can be lifted if you have enough memory and can dimension arrays of more than 256 elements in your computer.) My implementation of Bignum occupies most of the available storage space of an 8K Commodore PET. I haven't used any PET-specific "tricks" in the program, so it should be adaptable with little or no modification to other types of machines.

This article will first discuss a variety of problems in number theory which I've begun to use Bignum to investigate. I'll next describe in some detail the actual Bignum program, and give instructions for its use. Finally, I will mention some possible extensions and modifications to the program which some readers may be interested in pursuing. A listing of Bignum accompanies this article; I apologize for the lack of comments (and spaces) within the listing, but they had to be removed in order to fit the program into the limited memory of the PET.

Mark Zimmermann, 9410 Woodland Drive, Silver Spring, MD 20910.

Software prices for hardnosed shoppers:

MICRO PRO

APPLE CP/M®

WORD STAR*	259.00
SUPER SORT*	145.00
MAIL MERGER*	90.00
DATA STAR*	215.00
SPELL STAR*	195.00

S-100 CP/M®

WORD STAR	310.00
SUPER SORT	195.00
MAIL MERGER	110.00
DATA STAR	245.00
SPELL STAR	195.00

BRODERBUND

TAWALA'S LAST REDOUBT	24.95
GALAXY WARS	20.95
ALIEN RAIN (AKA GALAXIAN)	20.95
SNOGGLE (REQ. JOYSTICK)	27.95
ALIEN TYPHOON	20.95
APPLE PANIC	24.95
SPACE WARRIOR	20.95

AUTOMATED SIMULATIONS

INVASION ORION	20.95
STAR WARRIOR	32.95
TUES. MORNING QUARTERBACK	25.95
CRUSH, CRUMBLE AND CHOMP	24.95
THE DRAGON'S EYE	20.95

MUSE SOFTWARE

ROBOT WARS	32.95
THREE MILE ISLAND	32.95
A.B.M.	20.95
GLOBAL WAR	20.95
CASTLE WOLFENSTIEN	24.95
SUPER TEXT II	129.00

ON-LINE SYSTEMS

MYSTERY HOUSE	20.95
WIZZARD AND PRINCES	29.95
H/R FOOTBALL	32.95
H/R CRIBBAGE	20.95
MISSLE DEFENSE	25.95
CRANSTON MANOR	29.95
SABOTAGE	20.95
GOBBLERS	20.95
SOFT PORN ADVENTURE	24.95
PEGASUS II	25.95
EXPEDITER	73.95

PERSONAL SOFTWARE

DESKTOP PLAN II	159.00
CCA DATA MGT. SYSTEM	89.00
VISIPLOT	159.00
VISITREND/VISIPLOT	199.00
VISIDEX	159.00
VISITERM	129.00
VISICALC 3.3	159.00
CHECKER KING	21.95
GAMMON GAMBLER	21.95
BRIDGE PARTNER	21.95
MONTY PLAYS MONOPOLY	29.95
ZORK	32.95
MONTY PLAYS SCRABBLE	34.95

SIRIUS SOFTWARE

PHANTOMS FIVE	24.95
SPACE EGGS	24.95
AUTOBAHN	24.95
PULSAR II	24.95
GAMMA GOBLINS	24.95
GORGON	32.95
SNEAKERS	24.95
EPOCK	29.95
COPS AND ROBBERS	29.95

MORE GREAT APPLE GAMES

COMPUTER QUARTERBACK	32.95
THE WARP FACTOR	32.95
CARTELS AND CUTTHROATS	32.95
TORPEDO FIRE	49.95
THE SHATTERED ALLIANCE	49.95
COMPUTER BASEBALL	32.95
POOL 1.5	29.95
ULTIMA	33.95
RASTER BLASTER	24.95
FLIGHT SIMULATOR	27.95
INTERNATIONAL GRAND PRIX	25.95
COSMO MISSION	24.95
SARGON II	28.95
SHUFFLE BOARD	29.95

MICROSOFT

APPLE

FORTRAN*	165.00
BASIC COMPILER*	315.00
COBOL*	595.00
APPLE SOFT COMPILER	159.00
Z-80 SOFTCARD	299.00
RAMCARD	159.00
TYPING TUTOR	17.95
OLYMPIC DECATHLON	24.95

S-100 CP/M®

BASIC 80	299.00
BASIC COMPILER	319.00
FORTRAN 80	399.00
COBOL 80	599.00

PEACHTREE

APPLE CP/M®

GENERAL LEDGER	219.00
ACCT. RECEIVABLE	219.00
ACCT. PAYABLE	219.00
PAYROLL	219.00
INVENTORY	219.00

S-100 CP/M®

GENERAL LEDGER	595.00
ACCT. RECEIVABLE	595.00
ACCT. PAYABLE	595.00
PAYROLL	595.00
INVENTORY	595.00
PROPERTY MGMT.	799.00
CPA CLIENT WRITE-UP	799.00

APPLE BUSINESS SOFTWARE

MAGIC WINDOW	79.00
DB MASTER (NEW)	179.00
PFS: PERSONAL FILING SYS.	84.00
PFS: REPORT	84.00
Z-TERM*	79.95
ASCII EXPRESS	63.95
HAYDEN APPLESOFT COMPILER	149.00
EASY WRITER-PRO	199.00

S-100 SOFTWARE

d BASE II	599.00
SUPER CALC	249.00
MAGIC WAND	279.00
SPELLGUARD	239.00
PICKLES AND TROUT CP/M® MOD. II TRS-80	175.00

EDU-WARE

PERCEPTION PKG.	19.95
COMPU-READ	24.95
STORY TELLER	18.95
COMPU-MATH: ARITHMETIC	39.95
COMPU-MATH: FRACTIONS	34.95
COMPU-MATH: DECIMALS	34.95
COMPU-SPELL (REQ. DATA DISK)	24.95
COMPU SPELL DATA DISKS 1-4,ea.	17.95

TRS-80 GAMES

TEMPLE OF APSHAI	34.95
HELLFIRE WARRIOR	34.95
STAR WARRIOR	34.95
RESCUE AT RIGEL	24.95
CRUSH, CRUMBLE AND CHOMP	24.95
INVADERS FROM SPACE	17.95
PINBALL	17.95
STAR TREK 3.5	17.95
MISSILE ATTACK	18.95
STAR FIGHTER	24.95

*REQUIRES Z-80 SOFTCARD

IF YOU DON'T SEE IT, CALL US. WE HAVE ALL THE LATEST SOFTWARE.

Alpha Byte STORES

We built a reputation on our prices and your satisfaction.

We guarantee everything we sell for 30 days. If anything is wrong, just return the item and we'll make it right. And, of course, we'll pay the shipping charges.

We accept Visa and Master Card on all orders. COD accepted up to $300.00

Please add $2.00 for standard UPS shipping and handling on orders under 50 pounds, delivered in the continental U.S. Call us for shipping charges on items that weigh more than 50 pounds. Foreign, FPO and APO orders please add 15% for shipping. California residents add 6% sales tax.

(213)706-0333

31245 La Baya Drive, Westlake Village, California 91362

The prices quoted are only valid for stock on hand and all prices are subject to change without notice.

CP/M® is a registered trademark of Digital Research.

CIRCLE 159 ON READER SERVICE CARD

Topics to Explore with Bignum

In this very finite article, I can only begin to touch upon a few of the subjects which Bignum can help you explore. One of the most difficult things to do is to invent new, interesting, and important questions to ask—questions of which no one else has thought.

Frequently the ability to "experiment" with numbers can lead one to formulate a good question; probably the majority of classic mathematical theorems grew out of such experimentation with small numbers. The most important use of Bignum may be to extend one's reach to larger integers in this sort of play, so that new theorems or conjectures may be grasped.

One specific topic for which I have frequently used Bignum is the factoring of large numbers into a product of smaller integers. As mentioned above, occasional numbers (such as 17) cannot be broken down into smaller factors; such numbers are called primes.

Prime numbers become rarer as one moves into the realm of big integers, mainly because the bigger a number is, the more smaller numbers there are that may divide into it evenly. The chance of a random big integer being a prime is about one in 2.3 times the number of decimal digits in the number; for example, a thousand-digit number has about one chance in 2300 of being a prime.

A number can be tested for primality simply by trying all smaller integers and seeing whether any of them divide the number being tested. That's not very efficient, however! First of all, it is unnecessary to try any divisors which are greater than the square root of the target, since if the target has a factor greater than its square root, it must also have a factor smaller than the square root.

Second, it's not even necessary to try all of the numbers from two through the square root; once 2 has been tried and found to fail, there is no way for 4, 6, 8, or any other multiple of 2 to succeed in dividing the target number. Similarly, if 3 doesn't work, no multiple of 3 can, etc. To be really efficient, we need only try the prime numbers (2, 3, 5, 7, 11, 13, 17, . . .) smaller than the square root of our target; if none of them divide it, then the target is prime.

Trying all those potential factors is not an easy task. Even the largest, fastest computers would take an impossibly long time to factor a number a few hundred digits long, using the best known tricks to speed the process. What hope is there for a small machine?

Fermat Test

If one does not demand to see the explicit factors of a number, N, but simply asks the question, "Is N prime?" then there is hope of getting an answer. Consider the number A^{N-1}, the result of multiplying A*A*A*...*A with the number A occurring N-1 times in the product. A beautiful theorem, stated by Pierre de Fermat around 1640 and proved by Leonhard Euler about a century later, says that if N is prime, then N must leave a remainder of 1 when divided into A^{N-1} for any value of A not a multiple of N. Conversely, if the remainder left after division by N is not 1, then we know that N is not a prime (though we don't know what the factors of N are).

For example, suppose we want to test the number 15 for primality. We could choose $A = 2$ and calculate $A^{N-1} = 2^{14} = 16384$; then dividing 16384 by 15, we get 1092, with a remainder of 4. Since the remainder was not 1, we know that 15 is not a prime.

This Fermat test for primality is not quite complete: if we come out with a remainder not equal to 1, we know that our number N is not a prime, but if the remainder is 1, then N may be a prime—but it's not quite certain. There are numbers (fairly rare compared to the primes) which for many choices of A give a remainder of 1 in Fermat's test. Techniques exist to catch these exceptional numbers, but they're too complicated and I don't understand them well enough to attempt to explain them here. In the vast majority of cases, if the Fermat test answers "Maybe" to the question "Is N prime?" then the real answer is "Yes." References 1 and 2 give more details.

This Fermat test may not sound very practical; after all, isn't A^{N-1} a huge number itself, much larger than N, and won't it take a long time to compute it? Yes—but it doesn't matter. We don't want

The powerful package:

Super-Text II™

Allows you to learn the basics of text editing quickly. Advanced features will meet your expanding word processing requirements far into the future. $150.00

plus Form Letter™

Provides automatic repetitive printing of letters. Allows insertion anywhere in a letter, also direct entry, optional prompting, special commands. $100.00

plus Address Book™

Stores names, addresses, and telephone numbers and prints mailing labels. Has user-definable category system. $49.95

From the leader in word processing for the Apple II or II Plus

MUSE SOFTWARE™

330 N. CHARLES STREET
BALTIMORE, MD 21201
(301) 659-7212

Apple II is a trademark of Apple Computer Corp.

CIRCLE 314 ON READER SERVICE CARD

Call or write for information and the name of your nearest MUSE dealer

NEECO

WHY BUY FROM THE BEST?

Service... Support... Software...

MULTI-CLUSTER

For Commodore Systems: allows 3 CPU's (Expandable to 8) to access a single Commodore Disk.

MULTI-CLUSTER (3 CPU's)	$ 795
Each Additional CPU (up to 8)	$ 199

commodore

16K B (16K RAM-40 Column) - Lim. Qty	$ 995
32K B (32K RAM-40 Clm.) - Lim. Qty	$1295
4016 (16K RAM 4.0 Basic-40 Clm.)	$ 995
4032 (32K RAM 4.0 Basic-40 Clm.)	$1295
8032 (32K RAM 4.0 Basic-80 Clm.)	$1495
8050 Dual Disk (1 Meg Storage)	$1795
4040 Dual Disk (343K Storage)	$1295
8010 IEEE Modem	$ 280
C2N Cassette Drive	$ 95
CBM - IEEE Interface Cable	$ 40
IEEE - IEEE Interface Cable	$ 50
VIC 20 Home/Personal Computer	$ 295

ALTOS

ACS 8000-2 64K 1M	$ 4500
ACS 8000-15 64K 1M	$ 5990
ACS 8000-6 208K 14.5M	$10490
ACS 8000-7 208K 29.0M	$11690
ACS 8000-10 208K 10M	$ 8500
ACS 8000-10/MTU	$10990

NEC SPINWRITER PRINTERS

5530 (Parallel)	$3055
5510 (Serial)	$3055
5520 (KSR-Serial)	$3415
Tractor Option	$ 225

EPSON PRINTERS

MX-80 PRINTER	$ 645
MX-80 FT	$ 745
MX-100	$ 945
MX-70	$ 459
INTERFACE CARDS	
8141 (RS-232)	$ 75
8150 (2K Buffered RS-232)	$ 150
8161 (IEEE 488)	$ 55
8131 (Apple Card)	$ 85
8230 (Apple Card)	$ 25
8220 (TRS-80 Cable)	$ 35

APPLE

16K APPLE II+	$1330
32K APPLE II+	$1430
48K APPLE II+	$1530
APPLE DISK w/3.3 DOS	$ 650
APPLE DRIVE Only	$ 490
APPLE III 128K - In Stock! w/Monitor + Info Analystpak	$4740

DIABLO 630 PRINTER

DIABLO 630 - Serial - RS-232	$2710
Tractor Option	$ 250

AMDEK MONITORS

Video 100 12" B+W	$ 179
Video 300 12" Green	$ 249
Color I 13" Low Res	$ 449
Color II 13" High Res	$ 999

INTERTEC COMPUTERS

64K Superbrain (360 Disk Storage), CP/M™	$3495
64K QD Superbrain (700K Disk Storage), CP/M™	$3995

*CP/M is a registered trademark of Digital Research.

ATARI COMPUTERS

Atari 400 (16K RAM)	$ 399
Atari 800 (32K RAM) - good thru 8/31	$1080
Atari 410 RECORDER	$ 89.95
Atari 810 DISK DRIVE	$ 599.95

NEECO carries all available ATARI Software and Peripherals.

PROFESSIONAL SOFTWARE

WordPro 1 8K	$ 29.95
WordPro 3 (40 Clm.)16K	$ 199.95
WordPro 3+	$ 295
WordPro 4 (80 Clm.) 32K	$ 375
WordPro 4+	$ 450

JUST A SAMPLE OF THE MANY PRODUCTS WE CARRY. CALL US FOR OUR NEW 60-PAGE CATALOG.
WE WILL MATCH ANY ADVERTISED PRICE ON PRODUCTS LISTED UNDER SIMILAR "IN STOCK" CONDITIONS.

NEECO
679 HIGHLAND AVE.
NEEDHAM, MA 02194

(617) 449-1760
Telex: 951021

MON-FRI 9:00 - 5:00
MasterCharge and VISA Accepted

CIRCLE 285 ON READER SERVICE CARD

to know A^{N-1} itself; we only want to know the remainder left after division by N. So, as A^{N-1} is being calculated, we can keep it (relatively) small by dividing by N and keeping only the remainder as we go along. The final result will be the same.

To calculate A^{N-1} also does not require N-1 multiplications: by repeatedly squaring, multiplying, and squaring again, we can save time. For example, to compute A^{17} requires only five multiplications, as follows: first square A (yielding A^2), then square that result (which gives A^4), square again (giving A^8), square once more (giving A^{16}), and finally multiply by A again.

Bignum uses these tricks when computing the function X^Y (modulo Z), the remainder left after dividing X^Y by the number Z. It is quite efficient, and automatic.

Given this convenient test for primality of a big number, a variety of interesting questions can be attacked. The Fermat numbers F_m are defined by the equation

$$F_m = 2^{2^m} + 1$$

where the exponents must be evaluated from the top down. Thus, $F_0 = 3$, $F_1 = 5$, $F_2 = 17$, $F_3 = 257$, and $F_4 = 65537$. These Fermat numbers are all primes, and it turns out to be possible to construct, using only a compass and a straightedge, regular polygons with F_m sides, if F_m is a prime, and not otherwise.

Strangely enough, for m ranging from 5 through 16 (at least), F_m are not prime (Reference 2), and it is not known whether there are any more primes among the higher F_m. All of the Fermat numbers, whether prime or not, pass the A^{N-1} test for $A = 2$ and for $A = 3$, but there is a sure test for the primality of F_m: F_m is prime if and only if $3^{(F_m-1)/2}$ leaves a remainder of $F_m - 1$ when divided by F_m (Reference 2).

Mersenne Numbers

Another set of interesting and mathematically important numbers are the "Mersenne numbers" defined by

$$M_n = 2^n - 1$$

for prime values of n. (For n not a prime, M_n is never prime and is a bit less useful.) The first few Mersenne numbers are $M_2 = 3$, $M_3 = 7$, $M_5 = 31$, and $M_7 = 127$, all of which are primes; M_{11}, however, is divisible by 23.

The Greeks called a number "perfect" if it was equal to the sum of its divisors (excluding itself), like $6 = 1 + 2 + 3$, or $28 = 1 + 2 + 4 + 7 + 14$. All even perfect numbers have the form $M_n\,2^{n-1}$, for M_n prime. So, to find a perfect number, it is essential to have a test for the primality of M_n.

E. A. Lucas devised such a test in the late 1800's; it is described in References 1 and 2. Using it, and a rather large machine, L. Nickel and C. Noll found that M_{21701} is prime; it is 6533 decimal digits long, and is the largest prime yet found. (Reference 3).

Rep-Unit Numbers

Somewhat less interesting, except to base-ten chauvinists perhaps, are the "rep-unit" numbers defined by

$$R_n = (10^n - 1)/9;$$

they are called rep-unit numbers because they consist of strings of ones. Thus, $R_2 = 11$, $R_3 = 111$, $R_4 = 1111$, etc. For a rep-unit number to be prime, it must have a prime subscript; among the rep-units less than R_{1031}, the only primes are R_2, R_{19}, R_{23}, and R_{317} (Reference 4).

Other Applications

Besides determining prime numbers, another important application of large integer arithmetic is in the field of cryptography, the coding and decoding of messages. There are many mathematical operations which can be used to scramble the bits of a message. Useful operations for codemaking are ones which are easy to perform but hard to un-do (unless one knows the secret).

A prime example (pun intended) of such an encoding operation is our familiar function X^Y (mod Z): by using integers a few hundred digits long, it is possible to make a crypto-system that is apparently unbreakable, as far as mathematicians can tell today (References 5, 6, 7). Bignum is well-suited to investigating these new ideas in cryptography.

Another important application of large integer arithmetic is in the field of cryptography.

Finally, even if one has a problem involving non-integral numbers, Bignum may be able to help. By mentally placing a "decimal point" somewhere within the integers that the program is handling, one can do high-precision arithmetic, accurate to hundreds of decimal places.

For example, put the decimal point 100 places into the numbers. Addition and subtraction proceed as usual; after multiplication, one must divide by 10^{100} to renormalize the result, and after division, one multiplies by 10^{100}. This scaling of results can also be done before performing the operations. Thus, to compute the value of 355/113 to a hundred decimals, divide $355 * 10^{100}$ by 113 and mentally place a decimal point a hundred digits into the result.

Program Description

The program Bignum for handling arithmetic with large integers uses algorithms taken from Reference 1, Donald E. Knuth's, *Art of Computer Programming*, Volume 2; see in particular Chapter 4, section 4.3.1. The program avoids conversions into and out of base 10 by effectively working in base 10^4, that is, by breaking large decimal numbers up into four-digit chunks. The value of each chunk is an integer within the range 0 to 9999, and is stored as one element in an integer array. The Basic floating-point arithmetic which is used to perform operations on these chunks must be perfectly accurate to eight decimal places, so that it can correctly execute operations such as 9999 * 9999. If your Basic interpreter sometimes keeps fewer than eight significant decimal figures, you may want to work in base 10^3 or 10^2. Aside from changing the value of the Basic variable B to your new base, you will probably need to modify some of the input/output sections of the program as it is given in Listing 1.

To a user, Bignum seems much like a pocket calculator, specifically a Hewlett-Packard model HP-35. It has a stack of four numbers, named X, Y, Z, and T, and a memory register separate from the stack, named M. Numbers are input into the X register from the keyboard; from there, they can be pushed up into the stack, rolled down, stored into and recalled from memory, and operated upon.

Commands such as arithmetic operations are taken from the keyboard and stored in a command string, C$, where they are executed on a strictly left-to-right, reverse-Polish-notation basis. This simplifies the "parsing" part of the Bignum program (lines 1000 through 2999) which performs the commands for the user. If one prefers to use another scheme (such as an "algebraic" system with pending operations and parentheses), the parser can be modified without affecting any of the computational subroutines.

Because Bignum occupies so much of the available memory space of the small computer on which I developed it, there are no comments or spaces in Listing 1. The remainder of this section, therefore, combines documentation for the program and information for the user, and should be read in conjunction with the listing.

Comments By Line Number

Line 100 of Bignum dimensions the arrays used by the program: X%, Y%, Z%, T%, W%, and M%. Each array is allocated 256 elements, subscripts numbered 0 through 255, since that is the maximum allowable on my machine. An

Rainbow Computing, Inc. Announces!

PRO-PADDLE

For the Apple® II Computer

PRO-PADDLE is the only heavy-duty paddle available for the Apple II. It features compact sturdy metal construction, long-life switches with large buttons and tactile feedback, high accuracy paddle movement, shielded coaxial cables, and a molded plug. These paddles are designed and built by Computerworks and are constructed of the highest quality materials and workmanship available.

End your paddle problems for good! $39.95

Dealer Inquiries Invited.

Our catalog contains many more products for your Apple Computer. Please request a FREE catalog with your purchase. If you only want a copy of our catalog at this time, please send $2.00 for shipping. Thank you.

*Apple is the registered trademark of Apple Computer Inc.

RAINBOW COMPUTING INC.

Mail Order Dept. CC 12
19517 Business Center Drive
Northridge, CA 91324
Telephone: (213) 349-0300

Command	Definition
D	Display the contents of the X register.
E	Enter a number from the X register, pushing up the stack: Z→T, Y→Z, X→Y.
I	Input a number from the keyboard into the X register; stack not affected, old value of X destroyed.
C	Clear the X register, leaving zero; rest of stack unaffected.
+	Y+X→X, Z→Y, T→Z.
-	Y-X→X, Z→Y, T→Z.
?	display contents of stack; equivalent to command string DRDRDRDR.
R	Roll down stack: X→temp, Y→X, Z→Y, T→Z, temp→T.
S	Swap X and Y registers: X→temp, Y→X, temp→Y.
M	Memory interchange between M and X: X→temp, M→X, temp→M.
N	Negate X: -X→X.
*	Y*X→X, Z→Y, T→Z.
/	Y/X→temp, Y-X*INT(temp)→Y, INT(temp)→X.
T	Ten's power: input desired power of 10 from keyboard into the X register, old value of X destroyed, stack not moved.
Q	Quick look at contents of X, Y, Z, T, and M (only the most significant digits).
↑	X^Y (mod Z) → X, other values in stack except Z destroyed; M also destroyed. For X^Y, set Z to zero before execution.
6	Input 6 into the X register, destroying present contents of X and not otherwise affecting stack. Also works for 1 through 9.

Table 1.

element of an integer array can take on a value between -32767 and +32767, though Bignum uses only numbers between 0 and 9999. Arrays X%, Y%, Z%, and T% are used for the X, Y, Z, and T stack, array M% is the special memory which may be exchanged with the X register, and array W% is an auxiliary register, used for temporary storage within the program and not available to the user. Line 100 also defines B = 10000, the base used for the computations.

Line 500 gets a command string from the keyboard and places it in the string variable C$. Variable C is a pointer into C$ used by the parser; in line 1000 of Bignum, the pointer is incremented, and if it has reached the end of the command string, the program loops back to line 500 for more command inputs. Otherwise, execution proceeds into lines 1040 through 2999 where commands are recognized and performed.

The current single-character command is taken from C$ and placed in A$ by line 1040. That line also begins the monotonous task of recognizing the command, carried out by IF statements in lines 1040 through 1380. At most a single one of the IF statements will be satisfied; after a command has been executed, or if it is not among the legitimate commands available, line 2999 loops back to line 1000 where the next character in the command string is removed.

The individual commands included in Bignum are summarized in Table 1. They are all reasonably easy to remember, and after using the program for a short time you'll probably find that the commands become quite natural. Below, I will describe each command and tell what it does, how, and why.

First, however, it is useful to know the format in which Bignum stores numbers in its arrays. As mentioned above, a decimal number is broken up into four-digit pieces, each piece a positive integer between 0 and 9999, inclusive. For each of the X, Y, Z, T, and M registers, a variable exists which holds the sign of the contents of the corresponding register. In Basic notation, SX = SGN(X), SY = SGN(Y), and so forth for SZ, TS, and SM. (Note that the sign of the T register is stored in TS; the letter-combination ST is a reserved word in PET Basic.)

Each sign variable takes on only the values +1, 0, or -1, depending on whether the contents of the register are positive, zero, or negative. The four-digit pieces of the big numbers are stored in the arrays with least significant parts in the lowest numbered array elements and with most significant parts in higher numbered slots. The index of the most significant array element in use is stored in variables NX, NY, NZ, NT, and NM. For example, if the X register contains the number 1234567890, then SX = 1, X%(0) = 7890, X%(1) = 3456, X%(2) = 12, and NX = 2. The value of NX is thus just INT(LOG10(X)/4), where LOG10 means a logarithm to the base ten.

With the above background information about how numbers are stored internally, the remainder of the Bignum parser is easy to read and to understand. After extracting the current command and placing it in A$, line 1040 checks for a D, which means "Display the contents of X." If the command is D, subroutine lines 4000 through 4100 format the contents of the array X% as a string and print it, including the sign from SX. Program execution then returns to the line following 1040, all the subsequent IF tests fail, and at line 2999 we loop back to line 1000, where parsing continues.

If the command in A$ is E for "Enter," line 1060 detects it and calls subroutine 7000. "Enter" acts just like the "Enter" key on the Hewlett-Packard calculators: the contents of the Z register are copied into T, the contents of Y move into Z, and the contents of X are duplicated in Y. In other words, the "stack" is pushed up; the old value of T is lost.

The command I for "Input" is caught by line 1080 of the parser, which prints a prompting request for the X register and then calls a subroutine beginning at line 5000. That subroutine clears out the X register (using subroutine 8000) and accepts a string X$ from the keyboard. That string is then properly formatted as a positive integer and placed in the X% array by lines 5800 and 5840.

Two important things to note: (1) the "Input" command does *not* push up the stack automatically, unlike the usual HP-35 mode of operation (if you want automatic stack-lifting, insert a GOSUB7000 at

DDP

DISCOUNT
DATA PRODUCTS

presents

APPLE SOFTWARE

*** GAMES *** UTILITIES *** BUSINESS ***

30% OFF

‡SPECIAL ITEMS DISCOUNT

CHRISTMAS BONUS: Free Shipping on Orders of $65 or More.

APPLE	LIST PRICE	OUR PRICE
ADVENTURE INTERNATIONAL		
Adventure Hint Book	7.95	6.35
Adventures #1, #2, #3	D 39.95	27.95 ‡
Adventures #4, #5, #6	D 39.95	27.95 ‡
Adventures #7, #8, #9	D 39.95	27.95 ‡
Adventure #10 Savage Island	D 20.95	16.75
Planetoids	D 19.95	15.95
Adventures #10, #11, #12	D 39.95	27.95
Adventures 0 - 10 each	T 19.95	15.95
Asteroids/Planetoids	T 14.95	11.95
ARISCI		
Magic Window	D 99.95	79.95
Magic Mailer	D 69.96	55.95
Magic Speller	D 59.95	47.95
AUTOMATED SIMULATIONS		
Introductory 3 Pack (Rescue, Morloc's, and Datestones)	D 49.95	39.95
Temple of Apshai	D 39.95	31.95
Hellfire Warrier	D 39.95	27.95‡
Star Warrior	D 39.95	31.95
Crush, Crumble & Crunch	D 29.95	23.95
Dragon's Eye	D 24.95	19.95
Upper Reaches Apshai	D 19.95	15.95
Keys of Acheron	D 19.95	15.95
Datestones of Ryn	D 19.95	15.95
Tues Morn Qrtrback	D 29.95	23.95
AVALON HILL GAME COMPANY		
Empire Overmind	D 35.00	27.95
Mjr Leag Baseball	D 30.00	23.95
Tanktics	D 29.00	22.95
Mjr Leag Baseball	T 25.00	19.95
B-1 Nuclear Bomber	T 15.00	11.95
Midway Campaign	T 15.00	11.95
Nukewar	T 15.00	11.95
Conflict 2500	T 15.00	11.95
Planet Miners	T 15.00	11.95
Computer Acquire	T 20.00	15.95
Lords of Karma	T 20.00	15.95
Empire Overmind	T 30.00	23.95
Tanktics	T 24.00	19.95
BRODERBUND SOFTWARE		
Galactic Empire	D 24.95	19.95
Space Quarks	D 29.95	23.95
Genetic Drift	D 29.95	23.95
Snoggle	D 24.95	19.95
Alien Typhoon	D 24.95	19.95
Tawala's Lst Redoubt	D 29.95	23.95
Alien Rain	D 24.95	19.95
Demon Derby	D 24.95	19.95
Golden Mountain	D 19.95	15.95
Payroll	D395.00	319.95
Space Warrior	D 24.95	19.95
General Ledger	D395.00	319.95
Apple Panic	D 29.95	23.95
BUDGECO		
Raster Blaster	D 29.95	23.95
CAVALIER		
Asteroid Field	D 24.95	19.95
Star Thief	D 29.95	20.95
Bug Attack	D 29.95	23.95
CONTINENTAL SOFTWARE ★ CAVALIER		
Hyperspace Wars	D 29.95	23.95
L.A. Land Monopoly	D 29.95	23.95
Home Money Minder	D 34.95	27.95
3-D Skiing	D 24.95	19.95
CPA General Ledger	D250.00	199.95
CPA Acc. Rec.	D250.00	199.95
CPA Acc. Pay.	D250.00	199.95
CPA Payroll	D250.00	199.95

	LIST PRICE	OUR PRICE
CPA Prop. Mgt.	D175.00	139.95
DAKIN 5		
3.3 Programming Aids	D 90.00	71.95
★ DATAMOST		
DATA SOFT		
Micro Painter	D 34.95	24.50 ‡
Mychess W/Z 80	D 34.95	27.95
Micro Painter alb 1	D 19.95	15.95
Micro Painter alb 2	D 19.95	15.95
Chart Wizard	D 99.95	79.95
Lisp inter	D124.95	99.95
★ DELTA SOFTWARE ★ DENVER SOFTWARE		
★ EDU-WARE		
HAYDEN SOFTWARE		
Sargon II	D 34.95	24.50 ‡
Reversal	D 34.95	27.95
Data-Graph	D 49.95	39.95
Histo-Graph	D 29.95	23.95
Assembly Lang. Dev.	D 39.95	31.95
Applesoft Compiler	D200.00	159.95
HIGHLANDS COMPUTING		
Crae 2.0	D 24.95	19.95
Mcat 2.0	D 19.95	15.95
Oldars Revenge Wiz	D 19.95	15.95
Gobblins	D 27.50	21.95
Creature Venture	D 24.95	19.95
INNOVATIVE DESIGN SOFTWARE		
Pool 1.5	D 34.95	27.95
★ ISA ★ IUS ★ LAZER SYSTEM		
★ MICRO LAB		
MICROSOFT		
Typing Tutor	D 19.95	15.95
Olympic Decathlon	D 29.95	23.95
Adventure	D 29.95	23.95
A.L.D.S.	D125.00	99.95
WordStar	D375.00	299.95
★ MICRO SOFT ★ MICRO PRODUCTS		
★ MUSE		
ON-LINE SYSTEMS		
Mission Asteroid	D 19.95	15.95
Mystery House	D 24.95	19.95
Wiz & Princess	D 32.95	25.95
Cranston Manor	D 34.95	27.95
Ulysess	D 34.95	27.95
Time Zone	D 89.95	71.95
Threshold	D 39.95	33.95
Football	D 39.95	27.95 ‡
Missile Defense	D 29.95	20.95 ‡
Soccer	D 29.95	23.95
Sabotage	D 24.95	19.95
Superscribe Word Pr	D 89.95	71.95
Gobbler	D 24.95	19.95
Expediter II		
AppleSft Compiler	D 99.95	79.95
Dev. Sys.	D 79.95	64.95
Speed-asm	D 39.95	31.95
★ PICCADILLY ★ PHOENIX SOFTWARE		
PERSONAL SOFTWARE		
Checker King	D 24.95	20.95
Gammon Gambler	D 24.95	20.95
Monty Plays Monopoly	D 34.95	28.95
Zork	D 39.95	32.95
Microchess	D 24.95	20.95
Desktop Plan II	D199.95	159.95
Visiplot	D179.95	148.00

	LIST PRICE	OUR PRICE
Visicalc 3.3	D199.95	159.95
Visitrend	D259.95	207.95
Visiterm	D149.95	119.95
CCA Data Mgnt. Sys	D 99.95	85.95
★ QUALITY ★ RIVERBANK SOFTWARE		
SENSIBLE SOFTWARE		
Applesoft-Plus Str Basic	D 25.00	19.95
Applesoft Optimizer	D 20.00	15.95
DOS Plus	D 25.00	19.95
Disk Organizer	D 25.00	19.95
Disk Recovery	D 20.00	23.95
MultiDisk Ctlog III	D 25.00	19.95
Super Disk Copy III	D 30.00	23.95
SENTIENT SOFTWARE		
00-Topos	D 32.95	25.95
SIRIUS SOFTWARE ★ SIERRA SOFTWARE		
E-Z Draw 3.0	D 49.95	34.95‡
Phantoms 5	D 29.95	23.95
Space Eggs	D 29.95	23.95
Pulsar II	D 29.95	20.95 ‡
Autobahn	D 29.95	23.95
Orbitron	D 29.95	23.95
Gamma Goblins	D 29.95	23.95
Gorgon	D 39.95	31.95
Sneakers	D 29.95	23.95
Epoch	D 34.95	27.95
Cops & Robbers	D 34.95	24.45
Out Post	D 29.95	23.95
Beer Run	D 34.95	27.95
★ SIR-TECH SOFTWARE ★ SOFTAPE		
SOFTWARE PUBLISHING CO.		
PFS Per Filing Sys.	D 95.00	75.95
PFS: Report	D 95.00	75.95
SOUTHWESTERN DATA SYSTEMS		
Apple Doc. 3.3	D 44.95	35.96
The Correspondent	D 59.95	47.95
Ace 3.3	D 29.95	23.95
Ascii Express 3.3	D 64.95	51.95
Z-Term	D 99.95	79.95
Online	D 89.95	71.95
Speed Star	D135.00	108.95
STONEWARE		
DB Master	D225.00	179.95
STRATEGIC SIMULATIONS		
Computer Quarterback	D 39.95	31.95
Topedo Fire	D 59.95	41.95‡
Cartels & Cutthroats	D 39.95	31.95
Computer Baseball	D 39.95	31.95
The Warp Factor	D 39.95	31.95
Shattered Alliance	D 59.95	41.95‡
SYNERGISTIC SOFTWARE		
DoomCavern/Sorcerers	D 20.00	15.95
Higher Graphics II	D 35.00	24.50 ‡
Higher Text	D 40.00	31.95
Odyssey	D 30.00	23.95
Wilderness/Dungeon	D 32.50	27.95
Modifiable Data Reporter	D150.00	119.95
UNITED SOFTWARE OF AMERICA		
Appleworld	D 59.95	47.95
Super Kram	D175.00	139.95
Request	D225.00	179.95
Space Raiders	D 29.95	23.95
VERSA COMPUTING		
Versawriter	289.00	239.95
Versawriter Expansion Pak I	D 39.95	31.95
E Z Port	D 24.95	19.95
★TRS-80 ★ATARI ★COMMODORE		

★ SEND FOR OUR PRICE SHEET FOR SPECIFIC PROGRAMS AND PRICES.

PLEASE CHECK FOR SYSTEM REQUIREMENTS BEFORE ORDERING
INCLUDE PUBLISHER AND PRODUCT NAME
FOREIGN INQUIRIES INVITED — ADD 10% SHIPPING

All Orders Prepaid by Personal Check, Money Order, Cashier Check
For Faster Delivery Service COD — Cash Only/Master Charge — Visa
Mastercharge — Visa add 3%, and
include expiration date on card
Please Allow Sufficient Time for Checks to Clear
Please Add $2.50 for Shipping

California Residents Add 6% Sales Tax
Prices Valid Through This Month's Issue
Prices Subject to Change Without Notice
Please Specify Tape or Disk

DIRECT ORDER INQUIRIES TO:
DISCOUNT DATA PRODUCTS
P.O. BOX 19674-NC
SAN DIEGO, CA 92119
PHONE 714-287-0190

CIRCLE 158 ON READER SERVICE CARD

the beginning of line 5000; I prefer to control the process manually); and (2) "Input" expects to see a *positive*, unsigned integer (to input a negative number, follow the "Input" by a "Negate X" command, discussed below). The Commodore PET doesn't like to input strings longer than one or two lines (40 or 80 characters) from the keyboard, so if I need to input a very large number by hand, I break it up into parts of length 25 or 30 characters, enter the parts (from left to right), and after each part is entered, multiply it by 10^{25} or 10^{30}, so that it is ready to have the next part added to it. This procedure avoids all input difficulties and makes mistakes less common and easier to correct.

Line 1100 of the parser detects the C command, which "Clears X" by calling subroutine 8000, and does not otherwise affect the stack.

Line 1120 takes care of the first arithmetic operation, addition, symbolized by the + command. It calls subroutine 11000, which does addition just as one does it with pencil and paper, by adding corresponding elements of the X% and Y% arrays, including "carries" from one element to the next if the sum is greater than 9999. The special cases of X = 0, or Y = 0, are handled in lines 11000 and 11040; otherwise, the signs of the numbers being added are compared in line 11060.

If both signs are the same, the result has that sign too, and lines 14000 through 14080 do the addition and jump to lines 13000-13080 where the stack is dropped down before returning to the parser. If the contents of the X and the Y registers have opposite signs, lines 11080 through 11140 determine the correct sign for the sum; if the sum is nonzero, it is calculated by subtraction in lines 15000 through 15120.

To multiply two numbers, each 100 decimal digits long, to give a 200 digit product takes about 20 seconds.

The result of all this complicated work is that the sum of the contents of X and Y ends up in X, and the rest of the stack is dropped down: the former Z is put into Y, the former T into Z, and the T register keeps its value.

Subtraction is symbolized by – and is performed in the parser by line 1140, which simply changes the sign of the X register and calls the addition subroutine (beginning at line 11000). The result of the subtraction is Y – X, placed in the X register, and the stack drops just as it did for +.

The useful ? or "print stack" command is managed by line 1160 of the parser. (The ? mnemonic is suggested by the use of ? as an abbreviation for "PRINT" in many versions of Basic.) Since the goal is to print the whole contents of the stack, a series of alternating "Display X" and "Roll down the stack" commands does the job; after four of these pairs, the stack is back as it was initially and the contents of X, Y, Z, and T have been displayed. The parser does all this simply by replacing the ? command with the string DRDRDRDR, resetting the command-string pointer, and relying on the "Display" and "Roll down the stack" commands. As a convenience for the user, the caption STACK: is also printed out.

The R command mentioned in the previous paragraph, which asks to "Roll down the stack," is caught in parser line 1180 and executed in very straightforward fashion by subroutine 20000. R transfers the contents of T to Z, of Z to Y, of Y to X, and of X back up to T. No information is lost.

Line 1200 recognizes the S command, which "Swaps X and Y." It is done in a

Protect Your Software Investment

COPY II PLUS

YOUR MOST COST EFFECTIVE INSURANCE

With Copy II Plus you can make back-up copies of many currently available diskettes, even those that cannot be copied with standard programs.

SO RELAX

Copy II Plus ends your worries about accidental damage to valuable diskettes. You can make back-up copies for normal use and keep your originals safely locked away—away from spills or stray magnetic fields, or just the wear and tear of everyday use.

$39.95

IT'S FAST

You can copy diskettes in less than 35 seconds! That includes BASIC, PASCAL, FORTRAN, CP/M and nonstandard formats. Copy II Plus reads and writes five tracks at a time. For single disk drive users, this kind of efficiency means an immense savings in time and convenience. Only a 48K Apple II with one disk drive and DOS 3.3 is required.

AND IT EASILY PAYS FOR ITSELF

While some software companies offer replacement of expensive damaged diskettes, many do not. With Copy II Plus you eliminate the time, expense and worry of costly accidental damage.

IDEAL FOR NEW USERS

Copy II Plus is ideal for offices or institutions where inexperienced users have access to valuable software. Why risk your expensive original diskettes when they could be easily copied and safely tucked away?

GIVE YOURSELF PERMANENT INSURANCE NOW

Please send payment by check or credit card. No C.O.D.'s. Master Card or VISA accepted. Just include name of card, card number and expiration date. Address payment to:

CENTRAL POINT
Software, Inc.
P.O. Box 3563
Central Point, OR. 97502

Note: For your convenience, Copy II Plus is not copy protected and may be duplicated for back-up.

DEALER INQUIRIES INVITED

CIRCLE 119 ON READER SERVICE CARD

LEARN

Having trouble learning to use your computer?

Reference manuals don't teach. Most BASIC texts don't cover specific personal computers.

TIS solves these problems with step-by-step books tailored for your machine.

For PET/CBM

Understanding Your PET/CBM $16.95
Vol 1: Basic Programming
PET Graphics .... $ 6.95

For OSI C1P/C4P

Understanding Your C1P/C4P .... $ 9.95
A Workbook of BASIC Exercises

For VIC

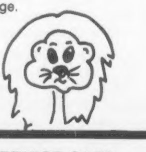
Understanding Your VIC $13.95
Vol. 1: Basic Programming

Money Back Guarantee. VISA/MC accepted.
All prices include UPS or 1st Class postage.

TIS INC

Total Information Services, Inc.
Box 921, Dept. CC
Los Alamos, NM 87544

CIRCLE 193 ON READER SERVICE CARD



subroutine occupying lines 6000 through 6060; the same "Swap" subroutine is used by other operations (such as addition, line 11000) when appropriate. The result of an S command is to interchange the contents of the X and Y registers; the rest of the numbers in the stack and in memory are left unchanged.

Line 1220 executes M for "Memory interchange with X." It calls a subroutine occupying lines 16000 through 16060, which interchanges the contents of X and M, the separate memory register in the machine. By using an interchange-type operation, the need for distinct "store in memory" and "recall from memory" commands is eliminated and some space is saved.

The extremely simple "N" or "Negate X" command is recognized and executed within line 1240 of the parser; all that is necessary is to set SX = – SX, that is, to change the sign of the contents of the X register.

Line 1260 does multiplication, the * operation. It calls subroutine 12000, wherein the proper sign of the result is determined and the actual multiplication is performed in much the same manner as one does it with pencil and paper. After multiplying, the properly-signed result X * Y is left in the X register and the rest of the stack is dropped down, just as it is after addition or subtraction.

Division is detected in line 1280, which looks for the / command and calls subroutine 17000 if it finds it. This subroutine is the most complicated in the Bignum program, but all of its details are taken almost literally from Knuth's book (Reference 1). After checking for zeroes in numerator or denominator, the subroutine scales both numbers in the division process by multiplying each by a constant, in order to simplify later work; the scaling factor is stored in the simple variable D. Lines 17300 through 17860 perform the division, with the "classical" division algorithm which is used for manual, pencil and paper long division by humans, slightly modified for the machine.

The result of this / operation consists of two numbers: an integer quotient and a remainder. The operation leaves the X register containing that quotient: in Basic notation, X contains INT(Y/X). The remainder left by the division, however, is frequently very useful for number theory investigations, so instead of throwing it away, it is placed in the Y register: in Basic, Y then contains Y – X*INT(Y/X). The stack does *not*, therefore, drop down after division, unlike the behavior of a pocket calculator.

One final remark: if either of the numbers being divided is negative, the remainder is *not* guaranteed to be correct; Bignum only promises to divide positive integers correctly. Negative divisors or dividends may be handled correctly, but I haven't checked it out completely, since I've never needed to use them in my work.

Returning to the parser, line 1300 senses the T command, for "power of ten." Upon receiving a T, the X register is cleared and the desired power of 10 is input from the keyboard and placed in X. All of this is done within line 1300; as in the "Input" command, T does not raise the stack.

The Q command, for "quick look at registers," is recognized by parser line 1340 and performed by subroutine 21000. It prints out the most-significant chunk of the X, Y, Z, T, and M registers, along with the corresponding power of ten, to allow a quick look at the contents of all registers without disturbing them.

A powerful command, ↑, calculates X^Y (mod Z), that is, the remainder left when the number X^Y is divided by Z; it is caught by parser line 1360 and handled in a subroutine beginning at line 25000. That subroutine uses the binary decomposition algorithm (repeatedly squaring and multiplying) described earlier in this article and in Reference 1. Most of the work is done by a sequence of subroutine calls to the multiplication and division routines. The ↑ command, therefore, is like a "macro" in that it invokes a sequence of more fundamental commands. It unfortunately uses most of the stack during its work; only the value in the Z register is preserved unchanged. The contents of X are replaced by the results of the computation X^Y (mod Z), and Y, T, and M contain partial results from the course of the calculations. If only the result X^Y is desired, the number in Z should be set to zero before beginning the execution of the ↑ command.

The final feature recognized by the parser, line 1380, is the presence of a positive integer, 1, 2, 3, . . ., 9. If an integer is found, it is put into the X register, just as though it had been Input with an "I" command. I have frequently found the ability to put in a small integer valuable when writing a long command string, and the process only takes up the single line in the parser.

That's all there is to Bignum.

Improvements and Enhancements

The version of Bignum given in Listing 1 is actually the second major revision of the program. My first efforts lacked the ↑ command and included some specialized stack-manipulation and input/output features which I never used much. I have tested Bignum extensively, and have shared it with a number of friends. None of us has yet observed any mathematical

MAIL ORDER DISCOUNTS

apple computer
Sales and Service

APPLE II PLUS 48K
$1,075
APPLE II PLUS 16K $1,025

HARDWARE

DISK II DRIVE & INTERFACE	499
DISK II SECOND DRIVE	439
BASF 5¼" DISKETTES (10)	25
LANGUAGE SYSTEM W/PASCAL	379
INTEGER BASIC FIRMWARE CARD	149
APPLESOFT II FIRMWARE CARD	149
CENTRONICS PRINTER INTERFACE CARD	179
HIGH-SPEED SERIAL INTERFACE CARD	145
GRAPHICS TABLET	649
APPLE IEEE-488 INTERFACE CARD	339
M&R SUP-R-MOD RF MODULATOR	25
MICROSOFT Z-80 SOFTCARD SYSTEM	299
MICROSOFT 16K RAM CARD	169
VIDEX 80 COLUMN BOARD	295
HAYES MICROMODEM II	299
AMDEX 13" COLOR MONITOR	429
NEC 12" GREEN MONITOR	255
SILENTYPE PRINTER W/INTERFACE	350
EPSON MX-100	829
QUME SPRINT 5/45 PRINTER	2499

SOFTWARE

APPLE DOS TOOLKIT	65
APPLE PLOT	60
TAX PLANNER	99
APPLE FORTRAN	159
APPLE PILOT	119
APPLEWRITER	65
DOW JONES PORTFOLIO EVALUATOR	45
DOW JONES NEWS & QUOTES REPORTER	85
THE CONTROLLER	495
VISICALC (16 SECTOR)	159
VISITREND/VISIPLOT	215
DESKTOP PLAN II	159
BPI BUSINESS SOFTWARE (EACH)	335
TAX PREPARER	85
REAL ESTATE ANALYZER	120
SUPER TEXT II	125
EASYWRITER (80 COLUMNS)	219
WORD STAR	299
D.B. MASTER	180
MICROSOFT FORTRAN	149

TO ORDER: Please send cashier's check, money order or personal check (allow 10 business days to clear). VISA and Master Card credit card service add 3%. American Express credit card service add 5%. Shipping, handling and insurance in U.S. add 3% (minimum $4). California residents add 6% sales tax. Foreign orders add 10% for shipping. Equipment is subject to price change and availability. All equipment carries factory warranty. Store prices differ from mail order prices. TELEX: 697120 DATAMAX-SDG

(800) 854-1941
Outside Ca. Order Desk

computer age, inc.
Authorized Apple Dealer & Service Center

(714) 565-4062
Technical & California

4688 CONVOY STREET, SAN DIEGO, CA 92111

CIRCLE 123 ON READER SERVICE CARD

errors committed by the program. I would appreciate it if any reader who finds a bug in the program would bring it to my attention.

If more memory is available, or if one is willing to sacrifice some of the features in the present version, there are several obvious modifications which should be considered. At present, command strings are simply read left-to-right and thrown away after they are used. A valuable ability to add would be looping or branching within command strings, so that more extensive programs could be written.

Another enhancement of the Basic-language Bignum program could be to include machine language modules to speed up the workings of the arithmetic operations. The Basic program is very portable and can be easily used on a variety of computers, but its speed is only fair.

In general, on the Commodore PET, a multiplication of two random numbers of m and n hundred digits takes approximately 20mn seconds; that is, to multiply two numbers, each 100 decimal digits long, to give a 200 digit product takes about 20 seconds. That's not intolerable, but machine-language could speed it up by a factor of 10 to 100. Mike Louder of Glendale, CA has developed some 6502 machine-language programs on the Apple II which multiply large numbers and raise them to powers; possibly that approach would be useful to take with Bignum.

In the final analysis, however, what may be needed is not more computing power but more mathematical insight. Many of the references cited at the end of this article (especially References 1, 2, and 8) contain good, introductory-level statements of fundamental, unsolved problems, which Bignum or an extension of it could be used to investigate. The small computer revolution will really have an impact on mathematics if somebody, inspired by Bignum or similar programs, takes a step forward and makes a discovery in number theory.

It may take years, and it may only happen if young people become excited enough by their home computers to become mathematicians, but I think that, in the long run, small machines will make a big difference to the progress of mathematics.

Acknowledgement

I thank Charles A. McCarthy for his help in obtaining the printout of Listing 1, which was done using his Cheepprint program.

References

1. Knuth, Donald E., *The Art of Computer Programming*, Vol. 2, Seminumerical Algorithms, Addison-Wesley, Reading, MA, 1969, esp. sections 4.3.1 and 4.5.4.
2. Shanks, Daniel, *Solved and Unsolved Problems in Number Theory*, Vol. 1, 2nd edition, Chelsea Publishing Co., New York, 1978.
3. "Onward and Upward," in "Science and the Citizen," *Scientific American*, Vol. 240, No. 1, pps. 85, 88 (Jan. 1979).
4. "R_{317} is Prime", in "Science and the Citizen," *Scientific American*, Vol. 238, No. 2, pps. 89, 90 (Feb. 1978).
5. Gardner, Martin, "Mathematical Games," *Scientific American*, Vol. 237, No. 2, pps. 120-124 (Aug. 1977).
6. Rivest, Ronald L., Shamir, Adi, and Adelman, Len, "On Digital Signatures and Public-Key Cryptosystems," MIT/LCS Technical Memo. No. 82, Apr. 1977.
7. Hellman, Martin E., "The Mathematics of Public-Key Cryptography," *Scientific American*, Vol 241, No. 2, pps. 146-157 (Aug. 1979).
8. Halberstan, Heini, "Some Unsolved Problems in Higher Arithmetic," in *The Encyclopaedia of Ignorance*, ed. by Ronald Duncan and Miranda Weston-Smith, Pocket Books, NY, 1977, pps. 191-203.

Listing 1.

```
 100 DIMX%(255),Y%(255),Z%(255),
     T%(255),W%(255),M%(255)
     :B=10000

 500 INPUTC$
     :C=0
     :C$=C$+" "

1000 C=C+1
     :IFC>LEN(C$)GOTO500

1040 A$=MID$(C$,C,1)
     :IFA$="D"THENGOSUB4000

1060 IFA$="E"THENGOSUB7000

1080 IFA$="I"THENPRINT"X:";
     :GOSUB5000

1100 IFA$="C"THENGOSUB8000

1120 IFA$="+"THENGOSUB11000

1140 IFA$="-"THENSX=-SX
     :GOSUB11000
1160 IFA$="?"THENC$="DRDRDRDR"
     +RIGHT$(C$,LEN(C$)-C)
     :C=0
     :PRINT"STACK:"

1180 IFA$="R"THENGOSUB20000

1200 IFA$="S"THENGOSUB6000

1220 IFA$="M"THENGOSUB16000

1240 IFA$="N"THENSX=-SX

1260 IFA$="*"THENGOSUB12000

1280 IFA$="/"THENGOSUB17000

1300 IFA$="T"THENGOSUB8000
     :INPUT"10^";K
     :NX=INT(K/4)
     :SX=1
     :X%(NX)=10^(K-4*NX)

1340 IFA$="Q"THENPRINT"APPROX:"
     :GOSUB21000

1360 IFA$="^"THENGOSUB25000

1380 IFVAL(A$)>0THENGOSUB8000
     :X%(0)=VAL(A$)
     :SX=1

2999 GOTO1000

4000 IFSX=0THENPRINT"0"
     :RETURN

4040 IFSX=-1THENPRINT"-";

4060 PRINTSTR$(X%(NX));
     :IFNX=0THENPRINT
     :RETURN

4080 FORI=NX-1TO0STEP-1
     :X$=STR$(X%(I))
     :X$=RIGHT$(X$,LEN(X$)-1)

4100 PRINTRIGHT$("000"+X$,4);
     :NEXT
     :PRINT
     :RETURN

5000 GOSUB8000
     :SX=1
     :NX=-1
     :INPUTX$

5800 D=LEN(X$)
     :IFD<>4*INT(D/4)THENX$="0"+X$
     :GOTO5800

5840 FORJ=D-3TO1STEP-4
     :NX=NX+1
     :X%(NX)=VAL(MID$(X$,J,4))
     :NEXT
     :X$=""
     :RETURN

6000 M=NX
     :IFM<NYTHENM=NY

6040 FORI=0TOM
     :K=X%(I)
     :X%(I)=Y%(I)
     :Y%(I)=K
     :NEXT

6060 K=NX
     :NX=NY
     :NY=K
     :K=SX
     :SX=SY
     :SY=K
     :RETURN

7000 M=NT
     :IFM<NZTHENM=NZ

7040 FORI=0TOM
     :T%(I)=Z%(I)
     :NEXT
     :NT=NZ
     :TS=SZ
     :M=NZ
     :IFM<NYTHENM=NY

7080 FORI=0TOM
     :Z%(I)=Y%(I)
     :NEXT
     :NZ=NY
     :SZ=SY
     :M=NY
     :IFM<NXTHENM=NX

7120 FORI=0TOM
     :Y%(I)=X%(I)
     :NEXT
     :NY=NX
     :SY=SX
     :RETURN

8000 FORI=0TONX
     :X%(I)=0
     :NEXT
     :NX=0
     :SX=0
     :RETURN

11000 IFSX=0THENGOSUB6000

11040 IFSY=0GOTO13000

11060 IFSX=SYGOTO14000

11080 SX=SGN((NY-NX)*SY)
      :IFSX<>0GOTO15000

11100 FORI=NXTO0STEP-1
      :SX=SGN((Y%(I)-X%(I))*SY)
      :IFSX<>0THENI=-1
```

QUALITY DISK SOFTWARE

BACKED BY ON-GOING APPLICATIONS SUPPORT

APPLE II Ⓐ ***TRS•80*** Ⓣ

HOME FINANCE PAK I: Entire Series $49.95 Ⓐ Ⓣ

CHECK REGISTER AND BUDGET: This comprehensive **CHECKING ACCOUNT MANAGEMENT SYSTEM** not only keeps complete records, it also gives you the analysis and control tools you need to actively manage your account. The system provides routines for **BUDGETING INCOME AND EXPENSE, AUTOMATIC CHECK SEARCH,** and **BANK STATEMENT RECONCILING. CRT** or printer reports are produced for **ACTUAL EXPENSE** vs **BUDGET, CHECK SEARCH DISPLAY RECONCILIATION REPORT** and **CHECK REGISTER DISPLAY** by month. Check entry is prompted by user-defined menus of standard purposes and recipient codes, speeding data entry and reducing disk storage and retrieval time. Six fields of data are stored for each check: amount, check no., date, purpose, recipient and **TAX DEDUCTIBLE REMINDER, CHECK SEARCH** routines allow searching on any of these data fields. Up to 100 checks/mo. storage $39.95

SAVINGS: Account management system for up to 20 separate Savings accounts. Organizes, files and displays deposits, withdrawals and interest earned for each account. $14.95

CREDIT CARD: Get Control of your credit cards with this program. Organizes, stores and displays purchases, payments and service charges for up to 20 separate cards or bank loans. $14.95

UNIVERSAL COMPUTING MACHINE: $49.95 Ⓐ

A user programmable computing system structured around a 50 row x 50 column table. User defines row and column names and equations forming a unique computing machine. Table elements can be multiplied, divided, subtracted or added to any other element. Hundreds of unique computing machines can be defined, used, stored, and recalled, for later use. Excellent for sales forecasts, budgets, inventory lists, income statements, production planning, project cost estimates-in short for any planning, analysis or reporting problem that can by solved with a table.

COLOR CALENDAR: $29.95 Ⓐ

Got a busy calendar? Organize it with Color Calendar. Whether it's birthdays, appointments, business meetings or a regular office schedule, this program is the perfect way to schedule your activities.
The calendar display is a beautiful **HI-RES** color graphics calendar of the selected month with each scheduled day highlighted in color. Using the daily schedule, you can review any day of the month and schedule an event or activity in any one of 20 time slots from 8:00 A.M. to 5:30 P.M.

BUSINESS SOFTWARE: Entire Series $159.95 Ⓐ Ⓣ

MICROACCOUNTANT: The ideal accounting system for small businesses. Based on classic T-accounts and double-entry booking, this efficient program provides a journal for recording posting and reviewing up to 1,000 transactions per month to any one of 300 accounts. The program produces **CRT** and printer reports covering:

TRANSACTION JOURNAL
ACCOUNT LEDGERS
BALANCE SHEET
INCOME AND EXPENSE STATEMENT

Includes a short primer on Financial Accounting. (48K) $49.95

UNIVERSAL BUSINESS MACHINE: This program is designed to **SIMPLIFY** and **SAVE TIME** for the serious businessman who must periodically Analyze, Plan and Estimate. The program was created using our Universal Computing Machine and it is programmed to provide the following planning and forecasting tools.

CASH FLOW ANALYSIS
PROFORMA PROFIT & LOSS
PROFORMA BALANCE SHEET
REAL ESTATE INVESTMENT
SALES FORECASTER
SOURCE AND USE OF FUNDS
JOB COST ESTIMATOR
INVENTORY ANALYSIS

Price, including a copy of the Universal Computing Machine $89.95

BUSINESS CHECK REGISTER AND BUDGET: Our Check Register and Budget programs expanded to include up to 50 budgetable items and up to 400 checks per month. Includes bank statement reconciling and automatic check search (48K) $49.95

ELECTRONICS SERIES VOL I & II: Entire Series $259.95

LOGIC SIMULATOR: SAVE TIME AND MONEY. Simulate your digital logic circuits before you build them. **CMOS, TTL,** or whatever, if it's digital logic, this program can handle it. The program is an interactive, menu driven, full-fledged logic simulator capable of simulating the bit-time response of a logic network to user-specified input patterns. It will handle up to 1000 gates, including **NANDS, NORS, INVERTERS, FLIP-FLOPS, SHIFT REGISTERS, COUNTERS** and user-defined **MACROS.** up to 40 user-defined random, or binary input patterns. Accepts network descriptions from keyboard or from **LOGIC DESIGNER** for simulation . . . . $159.95 Ⓐ Ⓣ

LOGIC DESIGNER: Interactive **HI-RES** graphics program for designing digital logic systems. Draw directly on the screen up to 10 different gate types, including **NAND, NOR, INVERTER, EX-OR, T-FLOP, JK-FLOP, D-FLOP, RS-FLOP, 4 BIT COUNTER** and **N-BIT SHIFT REGISTER.** User interconnects gates using line graphics commands. Network descriptions for **LOGIC SIMULATOR** generated simultaneously with the **CRT** diagram being drawn . . . . $159.95 Ⓐ

MANUAL AND DEMO DISK: Instruction Manual and demo disk illustrating capabilities of both program (s) . . . . $29.95 Ⓐ Ⓣ

ELECTRONIC SERIES VOL III & IV: Entire Series $259.95

CIRCUIT SIMULATOR: Tired of trial & error circuit design? Simulate & debug your designs before you build them! With **CIRCUIT SIMULATOR** you build a model of your circuit using **RESISTORS, CAPACITORS, INDUCTORS, TRANSISTORS, DIODES, VOLTAGE** and **CURRENT SOURCES** and simulate the waveform response to inputs such as **PULSES, SINUSOIDS, SAWTOOTHS,** etc. . .all fully programmable. The output is displayed as an **OSCILLOSCOPE-STYLE PLOT** of the selected waveforms (Apple only) or as a printed table of voltage vs time. Handles up to 200 notes and up to 20 sources. Requires 48 **RAM** . . . . $159.95 Ⓐ Ⓣ

CIRCUIT DESIGNER: Interactive **HI-RES** graphics program for designing electronic circuits. Draw directly on the screen up to 10 different component types, including those referenced above. Components interconnect list for **CIRCUIT SIMULATOR** generated automatically. Requires $159.95

MATHEMATICS SERIES: Entire Series $49.95

STATISTICAL ANALYSIS I: This menu driven program performs **LINEAR REGRESSION** analysis, determines the mean, standard deviation and plots the frequency distribution of user-supplied data sets. Printer, Disk, I/O routines $19.95

NUMERICAL ANALYSIS: HI-RES 2-Dimensional plot of any function. Automatic scaling. At your option, the program will plot the function, plot the **INTEGRAL,** plot the **DERIVATIVE,** determine the **ROOTS, MAXIMA; MINIMA, INTEGRAL VALUE** $19.95

MATRIX: A general purpose, menu driven program for determining the **INVERSE** and **DETERMINANT** of any matrix, as well as the **SOLUTION** to any set of **SIMULTANEOUS LINEAR EQUATIONS.** $19.95

3-D SURFACE PLOTTER: Explore the **ELEGANCE** and **BEAUTY** of **MATHEMATICS** by creating **HI-RES PLOTS** of 3-dimensional surfaces from any 3-variable equation. Disk save and recall routines for plots. Menu driven to vary surface parameters. Hidden line or transparent plotting $19.95

ACTION ADVENTURE GAMES: Entire Series $29.95 Ⓐ

RED BARON: Can you outfly the **RED BARON?** This fast action game simulates a machine-gun **DOGFIGHT** between your **WORLD WAR I BI-PLANE** and the baron's. You can **LOOP, DIVE, BANK** or **CLIMB**-and so can the **BARON.** In **HI-RES** graphics plus sound. $14.95

BATTLE OF MIDWAY: You are in command of the **U.S.S. HORNETS' DIVE-BOMBER** squadron. Your targets are the Aircraft carriers, Akagi, Soryu and Kaga. You must fly your way through **ZEROS** and **AA FIRE** to make your **DIVE-BOMB** run. In **HI-RES** graphics plus sound. $14.95

SUB ATTACK: It's April 1943. The enemy convoy is headed for the **CONTROL SEA.** Your sub, the **MORAY,** has just sighted the **CARRIERS** and **BATTLESHIPS'** Easy pickings. But watch out for the **DESTROYERS** - they're fast and deadly. In **HI-RES** graphics plus sound $14.95

FREE CATALOG-All programs are supplied on disk and run on Apple II w/Disk & Applesoft **ROM** Card & **TRS-80** Level II and require 32K **RAM** unless otherwise noted. Detailed instructions included. Orders shipped within 5 days. Card users include card number. Add $1.50 postage and handling with each order. California residents add 6½% sales tax. Foreign orders add $5.00 postage and handling.

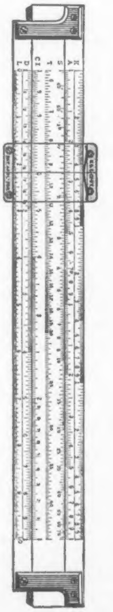
SPECTRUM SOFTWARE
142 Carlow, P.O. Box 2084
Sunnyvale, CA 94087

FOR PHONE ORDERS: (408) 738-4387
DEALER INQUIRIES INVITED.

VISA
master charge

Big Numbers, continued...

```
11120 NEXT
      :IFSX=0THENGOSUB8000
      :GOTO13000

11140 GOTO15000

12000 SX=SX*SY
      :IFSX=0THENGOSUB13000
      :GOTO8000

12060 FORJ=0TONX
      :W%(J)=0
      :NEXT
      :FORJ=0TONY
      :K=0
      :FORI=0TONX
      :M=X%(I)*Y%(J)+W%(I+J)+K

12080 K=INT(M/B)
      :W%(I+J)=M-B*K
      :NEXT
      :W%(J+NX+1)=K
      :NEXT

12100 NX=NX+NY+1
      :IFK=0THENNX=NX-1

12120 FORI=0TONX
      :X%(I)=W%(I)
      :NEXT

13000 M=NY
      :IFNZ>MTHENM=NZ

13040 FORI=0TOM
      :Y%(I)=Z%(I)
      :NEXT
      :NY=NZ
      :SY=SZ
      :M=NZ
      :IFNT>MTHENM=NT

13080 FORI=0TOM
      :Z%(I)=T%(I)
      :NEXT
      :NZ=NT
      :SZ=TS
      :RETURN

14000 M=NX
      :IFNY>MTHENM=NY

14040 K=0
      :FORI=0TOM
      :W=X%(I)+Y%(I)+K
      :K=0
      :IFW>=BTHENK=1
      :W=W-B

14060 X%(I)=W
      :NEXT
      :NX=M
      :IFK=1THENNX=NX+1
      :X%(NX)=1

14080 GOTO13000

15000 IFSX<>SYTHENGOSUB6000
      :SX=SY

15060 K=0
      :FORI=0TONY
      :W=Y%(I)-X%(I)+K
      :K=0
      :IFW<0THENK=-1
      :W=W+B

15080 X%(I)=W
      :NEXT
      :NX=NY

15100 IFX%(NX)=0THENNX=NX-1
      :GOTO15100

15120 GOTO13000

16000 M=NX
      :IFM<NMTHENM=NM

16040 FORI=0TOM
      :K=X%(I)
      :X%(I)=M%(I)
      :M%(I)=K
      :NEXT

16060 K=NX
      :NX=NM
      :NM=K
      :K=SX
      :SX=SM
      :SM=K
      :RETURN

17000 IFSX=0THENPRINT"/0 ERROR"
      :RETURN

17020 IFSY=0GOTO8000

17040 SX=SX*SY
      :SY=1
      :IFNX<NYGOTO17200

17060 I=NX
      :IFNX>NYGOTO8000

17100 IFX%(I)<Y%(I)GOTO17200

17120 IFX%(I)>Y%(I)GOTO8000

17140 I=I-1
      :IFI>=0GOTO17100

17160 GOSUB8000
      :GOSUB6000
      :GOSUB8000
      :SX=1
      :X%(0)=1
      :RETURN

17200 IFNX=0GOTO17800

17220 D=INT(B/(X%(NX)+1))
      :NY=NY+1
      :IFD=1GOTO17300

17240 K=0
      :FORI=0TONY
      :J=D*Y%(I)+K
      :K=INT(J/B)
      :Y%(I)=J-B*K
      :NEXT

17260 FORI=0TONX
      :J=D*X%(I)+K
      :K=INT(J/B)
      :X%(I)=J-B*K
      :NEXT

17300 FORJ=NYTONX+1STEP-1
      :IFY%(J)=X%(NX)THENM=B-1
      :GOTO17340

17320 M=INT((B*Y%(J)+Y%(J-1))
       /X%(NX))

17340 IF(X%(NX-1)*M)>((B*Y%(J)
      +Y%(J-1)-M*X%(NX))*B+Y%
       (J-2))THENM=M-1
      :GOTO17340

17360 K=0
      :FORI=0TONX+1
      :N=Y%(I+J-NX-1)-M*X%(I)+K
      :K=0
      :IFN<0THENK=INT(N/B)
      :N=N-B*K

17400 Y%(I+J-NX-1)=N
      :NEXT
      :W%(J-NX-1)=M
      :IFK=0GOTO17500

17420 W%(J-NX-1)=M-1
      :K=0
      :FORI=0TONX+1
      :N=Y%(I+J-NX-1)+X%(I)+K

17440 K=0
      :IFN>=BTHENN=N-B
      :K=1

17460 Y%(I+J-NX-1)=N
      :NEXT

17500 NEXT

17520 FORI=NY-NXTONX
      :X%(I)=0
      :NEXT

17540 FORI=0TONY-NX-1
      :X%(I)=W%(I)
      :NEXT
      :K=NY-NX
      :NY=NX
      :NX=K

17560 IFX%(NX)=0THENNX=NX-1
      :GOTO17560

17620 K=0
      :FORI=NYTOOSTEP-1
      :M=(K*B+Y%(I))/D

17640 Y%(I)=INT(M)
      :K=INT(.5+D*(M-Y%(I)))
      :NEXT

17650 IFY%(NY)>0THENRETURN

17660 NY=NY-1
      :IFNY<0THENNY=0
      :SY=0
      :RETURN

17680 GOTO17650

17800 K=0
      :FORI=NYTOOSTEP-1
      :M=(K*B+Y%(I))/X%(0)

17820 Y%(I)=INT(M)
      :K=INT(.5+X%(0)*(M-Y%(I)))
      :NEXT

17840 IFY%(NY)=0THENNY=NY-1
      :GOTO17840

17860 X%(0)=K
      :SY=SX
      :SX=SGN(K)
      :GOTO6000

20000 M=NX
      :IFNY>MTHENM=NY

20040 IFNZ>MTHENM=NZ

20060 IFNT>MTHENM=NT

20080 FORI=0TOM
      :K=X%(I)
      :X%(I)=Y%(I)
      :Y%(I)=Z%(I)
      :Z%(I)=T%(I)
      :T%(I)=K
      :NEXT

20100 K=NX
      :NX=NY
      :NY=NZ
      :NZ=NT
      :NT=K
      :K=SX
      :SX=SY
      :SY=SZ
      :SZ=TS
      :TS=K
      :RETURN

21000 PRINT"X:"SX*X%(NX)"*10^
      "NX*4
      :PRINT"Y:"SY*Y%(NY)"*10^
      "NY*4

21020 PRINT"Z:"SZ*Z%(NZ)"*10^
      "NZ*4
      :PRINT"T:"TS*T%(NT)"*10^
      "NT*4

21040 PRINT"M:"SM*M%(NM)"*10^
      "NM*4 :RETURN

25000 FORI=1TONM
      :M%(I)=0
      :NEXT
      :M%(0)=1
      :NM=0
      :SM=1
      :SX=ABS(SX)
      :SY=ABS(SY)
      :SZ=ABS(SZ)

25020 K=0
      :FORI=NYTOOSTEP-1
      :M=(Y%(I)+K*B)/2
      :Y%(I)=INT(M)
      :K=0
      :IFINT(M)<MTHENK=1

25060 NEXT
      :IFY%(NY)=0THENNY=NY-1
      :IFNY<0THENNY=0
      :SY=0

25080 IFK=0GOTO25500

25100 GOSUB7000
      :GOSUB16000
      :GOSUB12000
      :IFSZ=0GOTO25200

25120 GOSUB7000
      :GOSUB26000
      :GOSUB17000
      :GOSUB20000
      :RETURN

25200 GOSUB16000
      :IFSY=0THENGOSUB16000

25500 GOSUB7000
      :GOSUB12000
      :IFSZ=0GOTO25020

25520 GOSUB7000
      :GOSUB26000
      :GOSUB17000
      :GOSUB20000
      :GOTO25020

26000 M=NT
      :IFM<NXTHENM=NX

26020 FORI=0TOM
      :X%(I)=T%(I)
      :NEXT
      :NX=NT
      :SX=TS
      :RETURN
```



The Best Boards
SD Prices Slashed !!!

Single User System

SBC-200, 64K ExpandoRAM II, Versafloppy II, CP/M 2.2

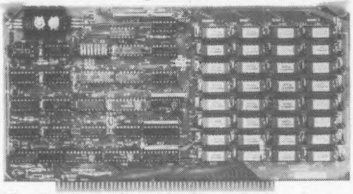
$995.00

4 MHz Z-80A CPU, 64K RAM, serial I/O port, parallel I/O port, double-density disk controller, CP/M 2.2 disk and manuals, system monitor, control and diagnostic software.

-All boards are assembled and tested-

ExpandoRAM III

64K to 256K expandable RAM board



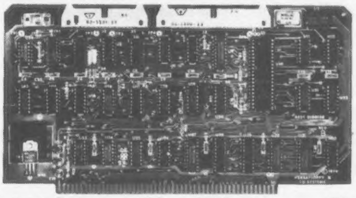
SD Systems has duplicated the famous reliability of their ExpandoRAM I and II boards in the new ExpandoRAM III, a board capable of containing 256K of high speed RAM. Utilizing the new 64K x 1 dymanic RAM chips, you can configure a memory of 64K, 128K, 192K, or 256K, all on one S-100 board. Memory address decoding is done by a programmed bipolar ROM so that the memory map may be dip-switch configured to work with either COSMOS/MPM-type systems or with OASIS-type systems.

Extensive application notes concerning how to operate the ExpandoRAM III with Cromemco, Intersystems, and other popular 4 MHz Z-80 systems are contained in the manual.

MEM-65064A	*64K A & T*	**$495.00**
MEM-65128A	*128K A & T*	**$639.95**
MEM-65192A	*192K A & T*	**$769.95**
MEM-65256A	*256K A & T*	**$879.95**

Versafloppy II

Double density controller with CP/M 2.2



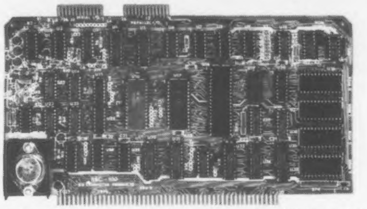
• S-100 bus compatible • IBM 3740 compatible soft sectored format • Controls single and double-sided drives, single or double density, 5¼" and 8" drives in any combination of four simultaneously • Drive select and side select circuitry • Analog phase-locked loop data seperator • Vectored interrupt operation optional • CP/M 2.2 disk and manual set included • Control/diagnostic software PROM included

The Versafloppy II is faster, more stable and more tolerant of bit shift and "jitter" than most controllers. CP/M 2.2 and all necessary control and diagnostic software are included.

IOD-1160A	*A & T with CP/M 2.2*	**$370.00**

SBC-200

2 or 4 MHz single board computer



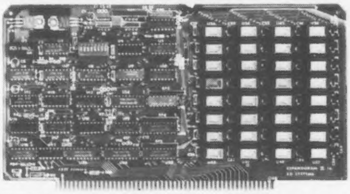
• S-100 bus compatible • Powerful 4MHz Z-80A CPU • Synchronous/asynchronous serial I/O port with RS-232 interface and software programmable baud rates up to 9600 baud • Parallel input and parallel output port • Four channel counter/timer • Four maskable, vectored interrupt inputs and a non-maskable interrupt • 1K of on-board RAM • Up to 32K of on-board ROM • System monitor PROM included

The SBC-200 is an excellent CPU board to base a microcomputer system around. With on-board RAM, ROM, and I/O, the SBC-200 allows you to build a powerful three-board system that has the same features found in most five-board microcomputers. The SBC-200 is compatible with both single-user and multi-user systems.

CPU-30200A	*A & T with monitor*	**$299.95**

ExpandoRAM II

16K to 64K expandable RAM board



• S-100 bus compatible • Up to 4MHz operation • Expandable from 16K to 64K • Uses 16 x 1 4116 memory chips • Page mode operation allows up to 8 memory boards on the bus • Phantom output disable • Invisible on-board refresh

The ExpandoRAM II is compatible with most S-100 CPUs. When other SD System' series II boards are combined with the ExpandoRAM II, they create a microcomputer system with exceptional capabilities and features.

MEM-16630A	*16K A & T*	**$325.00**
MEM-32631A	*32K A & T*	**$345.00**
MEM-48632A	*48K A & T*	**$365.00**
MEM-64633A	*64K A & T*	**$385.00**

COSMOS

Multi-user operating system

• Multi-user disk operating system • Allows up to 8 users to run independent jobs concurrently • Each user has a seperate file directory

COMOS supports all the file structures of CP/M 2.2, and is compatible at the applications program level with CP/M 2.2, so that most programs written to run under CP/M 2.2 or SDOS will also run under COSMOS.

SFC-55009039F	*COSMOS on 8" disk*	**$395.00**

Multi-User System

SBC-200, 256K ExpandoRAM III, Versafloppy II, MPC-4
COSMOS Multi-User Operating System, C BASIC II

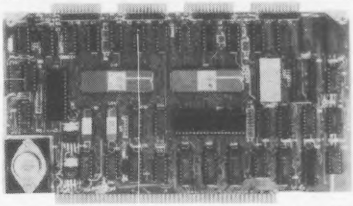
$1995.00

Two Z-80A CPUs (4 MHz), 256K RAM, 5 serial I/O ports with independently programmable baud rates and vectored interrupts, parallel input port, parallel output port, 8 counter/timer channels, real time clock, single and double sided/single or double density disk controller for 5¼" and 8" drives, up to 36K of on-board ROM, CP/M 2.2 compatible COSMOS interrupt driven multi-user disk operating system, allows up to 8 users to run independent jobs concurrently, C BASIC II, control and diagnostic software in PROM included.

-All boards are assembled and tested-

MPC-4

Intelligent communications interface



• Four buffered serial I/O ports • On-board Z-80A processor • Four CTC channels • Independently programmable baud rates • Vectored interrupt capability • Up to 4K of on-board PROM • Up to 2K of on-board RAM • On-board firmware

This is not just another four-port serial I/O board! The on-board processor and firmware provide sufficient intelligence to allow the MPC-4 to handle time consuming I/O tasks, rather than loading down your CPU. To increase overall efficiency, each serial channel has an 80 character input buffer and a 128 character output buffer. The on-board firmware can be modified to make the board SDLC or BISYNC compatible. In combination with SD's COSMOS operating system (which is included with the MPC-4), this board makes a perfect building block for a multi-user system.

IOI-1504A	*A & T with COSMOS*	**$495.00**

Place Orders Toll Free

Continental U.S.	*Inside California*
800-421-5500	**800-262-1710**

For Technical Inquires or Customer Service call:
213-973-7707

JADE
Computer Products

4901 W. Rosecrans, Hawthorne, Ca 90250

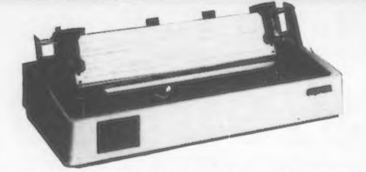
TERMS of SALE: Cash, checks, credit cards, or Purchase Orders from qualified firms and institutions. **Minimum Order $15.00.** California residents add 6% tax. Minimum shipping & handling charge $3.00. **Pricing & availibility subject to change**

CIRCLE 199 ON READER SERVICE CARD

JADE

Computer Products

Printers



BETTER THAN EPSON ! - Okidata

Microline 82A *80/132 column,* ***120 CPS****, 9 x 9 dot matrix, friction feed, pin feed, adjustable tractor feed (removable), handles 4 part forms up to 9.5" wide, rear & bottom feed, paper tear bar, 100% duty cycle/200,000,000 character print head, bi-directional/logic seeking, both serial & parallel interfaces included, front panel switch & program control of 10 different form lengths, uses inexpensive spool type ribbons, double width & condensed characters, true lower case descenders & graphics*

PRM-43082	*with FREE tractor*	**$539.95**

Microline 83A *132/232 column, 120 CPS, handles forms up to 15" wide, plus all the features of the 82A.*

PRM-43083	*with FREE tractor*	**$749.95**

PRA-27081A	*Apple card*	**$39.95**
PRA-27082A	*Apple cable*	**$19.95**
PRA-27087A	*TRS-80 cable*	**$24.95**
PRA-43080	*Extra ribbons pkg. of 2*	**$9.95**

INEXPENSIVE PRINTERS - Epson

MX-70 *80 column, 80 CPS, 5 x 7 dot matrix, adjustable tractor feed, & graphics*

PRM-27070	*List $459*	**$399.95**

MX-80 *80 column, 80 CPS, bi-directional/logic seeking printing, 9 x 9 dot matrix, adjustable tractor feed, & 64 graphics characters*

PRM-27080	*List $645*	**$469.95**

MX-80FT *same as MX-80 with friction feed added.*

PRM-27082	*List $745*	**$559.95**

MX-100 *132 column, correspondence quality, graphics, up to 15" paper, friction feed & adjustable tractor feed, 9 x 9 dot matrix, 80 CPS.*

PRM-27100	*List $945*	**$759.95**

PRA-27084	*Serial interface*	**$69.95**
PRA-27088	*Serial intf & 2K buffer*	**$144.95**
PRA-27081	*Apple card*	**$74.95**
PRA-27082	*Apple cable*	**$22.95**
PRA-27086	*IEEE 488 card*	**$52.95**
PRA-27087	*TRS-80 cable*	**$32.95**
PRA-27085	*Graftrax II*	**$95.00**
PRA-27083	*Extra ribbon*	**$14.95**

NEC 7700 & 3500

NEC Spinwriter w/Intelligent Controller

Standard serial, Centronics parallel, and current loop interfaces • Selectable baud rates 50 to 19,200 • Automatic bidirectional printing • Logic seeking • 650 character buffer with optional 16K buffer • 55 characters per second print speed • Comes with vertical forms tractor, ribbon, thimble and cable • Diablo compatible software • Available with or without optional front panel

PRD-55511	*1K no front panel*	**$2795.00**
PRD-55512	*16K no front panel*	**$2895.00**
PRD-55515	*1K w/front panel*	**$2995.00**
PRD-55516	*16K w/front panel*	**$3095.00**

Intersell NEC 3500Q

New from NEC - the 3500 series Spinwriters. Incorporates all the features and reliability of the 5500 and 7700 series Spinwriters into an inexpensive 30 CPS letter quality printer with an optional bi-directional tractor assembly.

PRD-55351	*3500Q 1K*	**$1995.00**
PRD-55352	*3500Q 16K*	**$2095.00**
PRA-55100	*Deluxe tractor option*	**$300.00**

Accessories for Apple

16K MEMORY UPGRADE

Add 16K of RAM to your TRS-80, Apple, or Exidy in just minutes. We've sold thousands of these 16K RAM upgrades which include the appropriate memory chips (as specified by the manufacturer), all necessary jumper blocks, fool-proof instructions, and our 1 year guarantee.

MEX-16100K	*TRS-80 kit*	**$25.00**
MEX-16101K	*Apple kit*	**$25.00**
MEX-16102K	*Exidy kit*	**$25.00**

16K RAM CARD - for Apple II

Expand your Apple to 64K, 1 year warranty

MEX-16500A	*Save $70.00 !!!*	**$129.95**

Z-80* CARD for APPLE

Two computers in one, Z-80 & 6502, more than doubles the power & potential of your Apple, includes Z-80 CPU card, CP/M 2.2, & BASIC-80*

CPX-30800A	*A & T*	**$299.95**

8" DISK CONTROLLER

New from Vista Computer, single or double sided, single or double density, compatible with DOS 3.2/3.3, Pascal, & CPM 2.2, Shugart & Qume compatible

IOD-2700A	*A & T*	**$499.95**

2 MEGABYTES for Apple II

Complete package includes: Two 8" double-density disk drives, Vista double-density 8" disk controller, cabinet, power supply, & cables, DOS 3.2/3.3, CP/M 2.2, & Pascal compatible.

1 MegaByte Package *(Kit)*	**$1495.00**
1 MegaByte Package *(A & T)*	**$1695.00**
2 MegaByte Package *(Kit)*	**$1795.00**
2 MegaByte Package *(A & T)*	**$19.95**

CPS MULTICARD - Mtn. Computer

Three cards in one! Real time clock/calendar, serial interface, & parallel interface - all on one card.

IOX-2300A	*A & T*	**$199.95**

AIO, ASIO, APIO - S.S.M.

Parallel & serial interface for your Apple (see Byte pg 11)

IOI-2050K	*Par & Ser kit*	**$139.95**
IOI-2050A	*Par & Ser A & T*	**$169.95**
IOI-2052K	*Serial kit*	**$89.95**
IOI-2052A	*Serial A & T*	**$99.95**
IOI-2054K	*Parallel kit*	**$69.95**
IOI-2054A	*Parallel A & T*	**$89.95**

A488 - S.S.M.

IEEE 488 controller, uses simple basic commands, includes firmware and cable, 1 year guarantee, (see April Byte pg 11)

IOX-7488A	*A & T*	**$399.95**

Modems

CAT MODEMS - Novation

CAT *300 baud, acoustic, answer/orginate*

IOM-5200A	*List $189.95*	**$149.95**

D-CAT *300 baud direct connect, answer/orginate*

IOM-5201A	*List $199.95*	**$169.95**

AUTO-CAT *Auto answer/orginate, direct connect*

IOM-5230A	*List $299.95*	**$239.95**

Apple-CAT - Novation

Software selectable 1200 or 300 baud, direct connect, auto-answer auto-dial, auxiliary 3-wire RS232C serial port for printer.

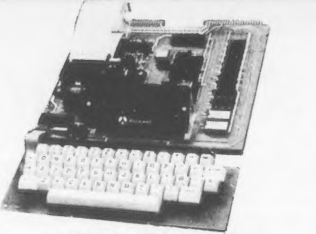
IOM-5232A	*Save $50.00!!!*	**$325.00**

SMARTMODEM - Hayes

Sophisticated direct-connect auto-answer/auto-dial modem, touch-tone or pulse dialing, RS-232C interface, programmable

IOM-5400A	*Smartmodem*	**$269.95**

Single Board Computer



AIM-65 - Rockwell

6502 computer with alphanumeric display, printer, & keyboard, and complete instructional manuals

CPK-50165	*1K AIM*	**$424.95**
CPK-50465	*4K AIM*	**$474.95**
SFK-74600008E	*8K BASIC ROM*	**$64.95**
SFK-64600004E	*4K assembler ROM*	**$43.95**
PSX-030A	*Power supply*	**$64.95**
ENX-000002	*Enclosure*	**$54.95**

4K AIM, 8K BASIC, power supply, & enclosure

Special package price	**$649.95**

Z-80 STARTER KIT - SD Systems

Complete Z-80 microcomputer with RAM, ROM, I/O, keyboard, display, kludge area, manual, & workbook

CPS-30100K	*KIT*	**$299.95**
CPS-30100A	*A & T*	**$469.95**

SYM-1 - Synertek Systems

Single board computer with 1K of RAM, 4K of ROM, key-pad, LED display, 20ma & cassette interface on board.

CPK-50020A	*A & T*	**$249.95**

Video Monitors

HI-RES 12" GREEN - Zenith

15 MHz bandwidth, 700 lines/inch, P31 green phosphor, switchable 40 or 80 columns, small, light-weight & portable.

VDM-201201	*List price $150.00*	**$118.95**

Leedex / Amdek

Reasonably priced video monitors

VDM-801210	*Video 100 12" B&W*	**$139.95**
VDM-801230	*Video 100-80 12" B& W*	**$179.95**
VDM-801250	*12" Green Phospor*	**$169.95**
VDC-801310	*13" Color I*	**$379.95**

12" COLOR MONITOR - NEC

Hi-res monitor with audio & sculptured case

VDC-651212	*Color Monitor*	**$479.95**

12" GREEN SCREEN - NEC

20 MHz, P31 phosphor video monitor with audio, exceptionally high resolution - A fantastic monitor at a very reasonable price

VDM-651200	*Special Sale Price*	**$199.95**

Video Terminals

AMBER SCREEN - Volker Craig

Detachable keyboard, amber on black display, 7 x 9 dot matrix, 10 program function keys, 14 key numeric pad, 12" non-glare screen, 50 to 19,200 baud, direct cursor control, auxiliary bi-directional serial port

VDT-351200	*List $795.00*	**$645.00**

VIEWPIONT - ADDS

Detachable keyboard, serial RS232C interface, baud rates from 110 to 19,200, auxiliary serial output port, 24 x 80 display,

VDT-501210	*Sale Priced*	**$639.95**

TELEVIDEO 950

VDT-901250	*List $1195.00*	**$995.00**

DIALOGUE 80 - Ampex

VDT-230080	*List $1195.00*	**$895.00**

JADE
Computer Products

S-100 CPU Boards

THE BIG Z* - Jade

2 or 4 MHz switchable Z-80 CPU with serial I/O, accomodates 2708, 2716, or 2732 EPROM, baud rates from 75 to 9600*

CPU-30201K	*Kit*	**$139.95**
CPU-30201A	*A & T*	**$189.95**
CPU-30200B	*Bare board*	**$35.00**

2810 Z-80* CPU - Cal Comp Sys

2/4 MHz Z-80A CPU with RS-232C serial I/O port and on-board MOSS 2.2 monitor PROM, front panel compatible.*

CPU-30400A	*A & T*	**$269.95**

CB-2 Z-80 CPU - S.S.M.

2 or 4 MHz Z-80 CPU board with provision for up to 8K of ROM or 4K of RAM on board, extended addressing, IEEE S-100, front panel compatible.

CPU-30300K	*Kit*	**$239.95**
CPU-30300A	*A & T*	**$299.95**

S-100 PROM Boards

PROM-100 - SD Systems

2708, 2716, 2732 EPROM programmer w/software

MEM-99520K	*Kit*	**$189.95**
MEM-99520A	*A & T*	**$249.95**

PB-1 - S.S.M.

2708, 2716 EPROM board with built-in programmer

MEM-99510K	*Kit*	**$154.95**
MEM-99510A	*A & T*	**$219.95**

EPROM BOARD - Jade

16K or 32K uses 2708's or 2716's, 1K boundary

MEM-16230K	*Kit*	**$79.95**
MEM-16230A	*A & T*	**$119.95**

S-100 Video Boards

VB-3 - S.S.M.

80 characters x 24 lines expandable to 80 x 48 for a full page of text, upper & lower case, 256 user defined symbols, 160 x 192 graphics matrix, memory mapped, has key board input.

IOV-1095K	*4 MHz kit*	**$349.95**
IOV-1095A	*4 MHz A & T*	**$439.95**
IOV-1096K	*80 x 48 upgrade*	**$39.95**

VDB-8024 - SD Systems

80 x 24 I/O mapped video board with keyboard I/O, and on-board Z-80A.*

IOV-1020A	*A & T*	**$459.95**

VIDEO BOARD - S.S.M.

64 characters x 16 lines, 128 x 48 matrix for graphics, full upper/lower case ASCII character set, numbers, symbols, and greek letters, normal/reverse/blinking video, S-100.

IOV-1051K	*Kit*	**$149.95**
IOV-1051A	*A & T*	**$219.95**
IOV-1051B	*Bare board*	**$34.95**

S-100 Motherboards

ISO-BUS - Jade

Silent, simple, and on sale - a better motherboard

	6 Slot (5¼" x 8⅝")	
MBS-061B	*Bare board*	**$19.95**
MBS-061K	*Kit*	**$39.95**
MBS-061A	*A & T*	**$49.95**
	12 Slot (9¾" x 8⅝")	
MBS-121B	*Bare board*	**$29.95**
MBS-121K	*Kit*	**$69.95**
MBS-121A	*A & T*	**$89.95**
	18 Slot (14½" x 8⅝")	
MBS-181B	*Bare board*	**$49.95**
MBS-181K	*Kit*	**$99.95**
MBS-181A	*A & T*	**$139.95**

S-100 RAM Boards

MEMORY BANK - Jade

4 MHz, S-100, bank selectable, expandable from 16K to 64K

MEM-99730B	*Bare Board*	**$49.95**
MEM-99730K	*Kit no RAM*	**$199.95**
MEM-32731K	*32K Kit*	**$239.95**
MEM-64733K	*64K Kit*	**$279.95**
Assembled & Tested		add **$50.00**

64K RAM - Calif Computer Sys

4 MHz bank port / bank byte selectable, extended addressing, 16K bank selectable, PHANTOM line allows memory overlay, 8080 / Z-80 / front panel compatible.

MEM-64565A	*A & T*	**$575.00**

64K STATIC RAM - Mem Merchant

64K static S-100 RAM card, 4-16K banks, up to 8MHz

MEM-64400A	*A & T*	**$789.95**

32K STATIC RAM - Jade

2 or 4 MHz expandable static RAM board uses 2114L's

MEM-16151K	*16K 4 MHz kit*	**$169.95**
MEM-32151K	*32K 4 MHz kit*	**$299.95**
Assembled & tested		add **$50.00**

16K STATIC RAM - Mem Merchant

4 MHz 16K static RAM board, IEEE S-100, bank selectable, Phantom capability, addressable in 4K blocks, "disable-able" in 1K segments, extended addressing, low power

MEM-16171A	*A & T*	**$164.95**

S-100 Disk Controllers

DOUBLE-D - Jade

Double density controller with the inside track, on-board Z-80A, printer port, IEEE S-100, can function on an interrupt driven buss*

IOD-1200K	*Kit*	**$299.95**
IOD-1200A	*A & T*	**$375.00**
IOD-1200B	*Bare board*	**$59.95**

DOUBLE DENSITY - Cal Comp Sys

5¼" and 8" disk controller, single or double density, with on-board boot loader ROM, and free CP/M 2.2 and manual set.*

IOD-1300A	*A & T*	**$374.95**

S-100 I/O Boards

S.P.I.C. - Jade

Our new I/O card with 2 SIO's, 4 CTC's, and 1 PIO

IOI-1045K	*2 CTC's, 1 SIO, 1 PIO*	**$179.95**
IOI-1045A	*A & T*	**$239.95**
IOI-1046K	*4 CTC's, 2 SIO's, 1 PIO*	**$219.95**
IOI-1046A	*A & T*	**$299.95**
IOI-1045B	*Bare board w/ manual*	**$49.95**

I/O-4 - S.S.M.

2 serial I/O ports plus 2 parallel I/O ports

IOI-1010K	*Kit*	**$179.95**
IOI-1010A	*A & T*	**$249.95**
IOI-1010B	*Bare board*	**$35.00**

S-100 Mainframes

MAINFRAME - Cal Comp Sys

12 slot S-100 mainframe with 20 amp power supply

ENC-112105	*Kit*	**$329.95**
ENC-112106	*A & T*	**$399.95**

DISK MAINFRAME - N.P.C.

Holds 2 8" drives and a 12 slot S-100 system. Attractive metal cabinet with 12 slot motherboard & card cage, power supply, dual fans, lighted switch, and other professional features

ENS-112325	*with 25 amp p.s.*	**$699.95**

CIRCLE 199 ON READER SERVICE CARD

Disk Drives

Handsome metal cabinet with proportionally balanced air flow system • Rugged dual drive power supply • Power cable kit • Power switch, line cord, fuse holder, cooling fan • Never-Mar rubber feet • All necessary hardware to mount 2-8" disk drives, power supply, and fan • Does not include signal cable

Dual 8" Subassembly Cabinet

END-000420	*Bare cabinet*	**$59.95**
END-000421	*Cabinet kit*	**$225.00**
END-000431	*A & T*	**$359.95**

8" Disk Drive Subsystems
Single Sided, Double Density

END-000423	*Kit w/2 FD100-8Ds*	**$924.95**
END-000424	*A & T w/2 FD100-8Ds*	**$1124.95**
END-000433	*Kit w/2 SA-801Rs*	**$999.95**
END-000434	*A & T w/2 SA-801Rs*	**$1195.00**

8" Disk Drive Subsystems
Double Sided, Double Density

END-000426	*Kit w/2 DT-8s*	**$1224.95**
END-000427	*A & T w/2 DT-8s*	**$1424.95**
END-000436	*Kit w/2 SA-851Rs*	**$1495.00**
END-000437	*A & T w/2 SA-851Rs*	**$1695.00**

QUME DT-8

8" Double-Sided, Double-Density Disk Drive

1 Drive	**$524.95 each**
2 Drives	**$499.95 each**
10 Drives	**$479.95 each**

Jade Part Number MSF-750080

Shugart 801R

8" Single-Sided, Double-Density Disk Drive

1 Drive	**$394.95 each**
2 Drives	**$389.95 each**

Jade Part Number MSF-10801R

SIEMENS 8"

8" Single-Sided, Double-Density Disk Drive

1 Drive	**$384.95 each**
2 Drives	**$349.95 each**
10 Drives	**$324.95 each**

Jade Part Number MSF-201120

MPI B-51

5¼" Single-Sided, Double-Density Disk Drive

1 Drive	**$234.95 each**
2 Drives	**$224.95 each**
10 Drives	**$219.95 each**

Jade Part Number MSM-155100

END-000213	*Case & power supply*	**$74.95**

SURVIVAL

Stewart F. Rush

It is the year 1991. You have crash landed on the Earth's moon. Your mission: Survival!

Inital Status:
ELAPSED TIME: 0 MINUTES
POWER UNITS: 230 UNITS
OXYGEN REMAINING: 180 MINUTES
PRESENT LOCATION STATUS: YOU ARE AT MARE SERENITATIS. LONG, EERIE SHADOWS FROM DISTANT MOUNTAINS AND CRATERS CAST THEMSELVES ACROSS THE BARREN LANDSCAPE.

Game Description

This game is patterned after the now famous Adventure programs and their many derivatives. It requires logic, skill, and persistence, and the object is survival.

The action takes place somewhere on the surface of the moon, and the player must assess the situation, explore the surroundings, avert potential hazards, and gather resources which may be needed.

It is a race against time. Many explorations are required before the total situation is revealed and the resources and life-threatening situations discovered. Only then, can the process of determining the optimum set of moves and actions begin.

Once the player succeeds in surviving it becomes a challenge to generate survival sequences which result in the minimum elapsed time.

As with Adventure, the computer accepts directional commands: NORTH, SOUTH, EAST, WEST, UP, and DOWN. Other commands consist of an action verb followed by a noun. Verbs include USE, GET, TRY, and INVENTORY.

For brevity, the program uses only the first three characters of a command or item name. In addition, the directional commands can be entered as single letters, e.g. N, S, W, E, U, D.
The following are some sample keyboard entries:

```
?
GET ILLUM     (get an illuminator)
?
N             (go north)
?
DROP KEY      (leave the key)
```

Program Description

The program, by design, is relatively small, and requires no additional peripheral devices such as disk drives to store textual and descriptive information. Thus it may be adapted for use on relatively small

Stewart F. Rush, 1182 Wilhelmina Way, San Jose, CA 95120.

Table 1.

M(P.1) = location to go to if direction is NORTH
M(P.2) = location to go to if direction is SOUTH
M(P.3) = location to go to if direction is EAST
M(P.4) = location to go to if direction is WEST
M(P.5)= location to go to if direction is UP
M(P.6) = location to go to if direction is DOWN
M(P.7) = pointer to first print line in TS vector
M(P.8) = pointer to last print line in TS vector

Table 2.

P - The current location.
R - The previous location (P for the previous location).
T1 - The current elapsed time.
T2 - The amount of oxygen remaining in the oxygen module:
P1 - The amount of power remaining in the power unit.
P2 - The amount of power remaining in the power pack.
V - The number of visits to the control center.
C - The number of items being carried.
F0 - Flag: oxygen in use.
F1 - Flag: Meteor shower.
F2 - Flag: Shed open.
F4 - Flag: Illuminator on.
F7 - Flag: Bomb deactivated.
F9 - Flag: Oxygen required in station.

computer tutor

JANUARY SPECIAL
EXPEDITER II
74.95
TRS-80 ALDS
(MICRO SOFT)
79.95

SELLS SOFTWARE FOR
APPLE* & TRS-80†

ACORN, VERSA, NIBBLE, ADVENTURE INT'L, MICROSOFT, USA, SYNERGISTIC, ON-LINE, QUALITY, SENTIENT, BEDGECO, IDSI, MICRO CO-OP, SIRIUS, HAYDEN, EDU-WARE, SUB-LOGIC, CONTINENTAL, BIG-FIVE, EPYX, APPARAT, CENTRAL POINT, STRATEGIC, PERSONAL, MUSE, TG PRODUCTS, CAVALIER, BRODERBUND, MICRO LAB, SENSIBLE, IJG, CORNSOFT, LAZER, RIVERBANK, SOFTWARE PUBLISHING, BEAGLE BROS., PDI.

— SAMPLE DISCOUNTS —

SUPER DISK COPY III	30.00	*now*	**25.00**
ELECTRIC PENCIL 2.0	89.95	*now*	**76.95**
SPACE QUARKS	29.95	*now*	**25.00**
ENHBAS	59.95	*now*	**50.95**
INT'L GRAND PRIX	30.00	*now*	**25.00**
BASIC FASTER & BETTER	29.95	*now*	**25.50**
VISICALC 3.3	199.95	*now*	**159.00**
ZORK	39.95	*now*	**34.95**
APPLESOFT COMPILER	200.00	*now*	**169.95**
FORTRAN 80	100.00	*now*	**84.00**
COPTS and ROBBERS	34.95	*now*	**29.75**
ROBOT ATTACK	19.95	*now*	**16.95**
SUPERSCRIBE	129.95	*now*	**110.50**
MAXI MANAGER	79.95	*now*	**67.95**
CRUSH, CRUMBLE & CHOMP	29.95	*now*	**25.00**
DO SOURCE 3.3 (R. HYDE)	39.95	*now*	**33.95**

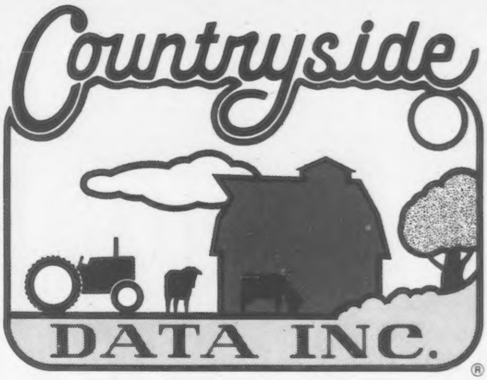
We Pay Shipping — Big Discounts
Visa/Mastercharge/C.O.D.
All Programs Shipped From Stock

Call or Write for Free Catalog:

(503) 895-3388

COMPUTERTUTOR
83242N PAC HWY
CRESWELL, OR 97426

*Reg. TM Apple Computers
†Reg. TM Tandy Corp.



The wait was worth it . . .

Agri-Business Packages are now available

- **Accounting**
- **Herd Records**
- **Crop Management**
- **Budgeting**
- **Control Costs**

Dealer Inquiries Invited

General Business Packages Available

Countryside Data ®

718 North Skyline
Suite 201(B)
Idaho Falls, Idaho
83401

Please write or call
(208) 529-8576

Name ____________________

Address ____________________

City ____________________

State __________ Zip __________

CIRCLE 248 ON READER SERVICE CARD

computers (see "Conversion"). In the author's case, the program is implemented on a home brew, S-100 bus system with 8K of RAM.

The program is directed by a move matrix M. There is one vector for each location P in the game. Table 1 lists the significance of each vector in the matrix M.

If the vector element (1-6) contains a value of "0," then the move requested in that direction is invalid. If the vector element contains a "99," then the game is terminated.

The T$ vector contains the textual description of all of the various locations. As an example, the first three elements in the vector contain the description for location 1 in the M matrix. Looking at the line 9001, the seventh and eighth data items correspond to M(1,7) which has a value of 1, and M(1,8) which has a value of 3.

Table 2 lists the variables used in the program.

Table 3 lists each of the objects used in the program which are contained in the 0 vector. Normally the vector element in 0, for a given object, contains either the P location of that item, or a value of 99 indicating that the player is carrying that item.

0(1) - An electronic key.
0(2) - Sealant.
0(3) - An oxygen module.
0(4) - An illuminator.
0(5) - A robot.
0(6) - A deactivator.
0(7) - A nuclear bomb.
0(8) - A transporter unit.
0(9) - Dilithium crystals.
0(10) - A computer message.
0(11) - A power unit.
0(12) - A mirror.
0(13) - A coded badge.
0(14) - A power pack.

Table 3.

Locations 1-18, and 38 normally require oxygen. All other locations are within the space station or the space craft. Locations 1-21, and 38 require a power unit or pack. All other locations are within the space station.

Changing the Complexity of the Game

Normally, the program permits the player to carry four items. One way the difficulty can be increased is by permitting only three items to be carried. In this case, a longer survival time results, and the following statements must be updated:

```
 350 LET T2=275
 360 LET P1=320
 370 LET P2=75
 730 IF T1>485 THEN 2960
 740 IF T1>380 THEN 3840
2270 IF C>2 THEN 2390
```

Reducing Program Size

The following are suggested to reduce the size of the program for computers which cannot accommodate the program as shown in the listing.

1. Eliminate the printed instuctions, statements 90-120, and 5020 to 5230.
2. Eliminate the REM or remark statements.
3. Eliminate the use of verb or action word synonyms, statements 1340, 1360, 1370, 1390, 1400, etc. Also refer to statements 4660 through 4800 for use of synonyms.
4. Following the full program listing is a partial program listing which replaces statements 7500 through 9042. These employ shortened location descriptions and require the following program modifications:

```
  10 DIM T$40 (60)
 130 FOR I=1 TO 60
 560 LET M(2,8)=M(2,7)+1
3760 LET M(2,8)=M(2,7)
```

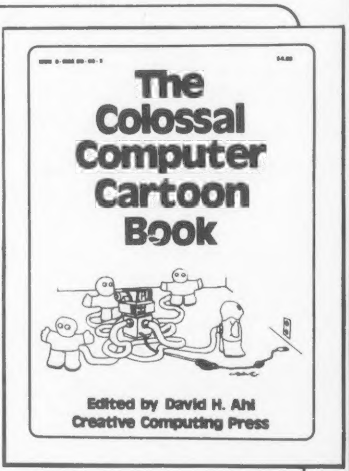
Do Computer Enthusiasts Have More Fun?

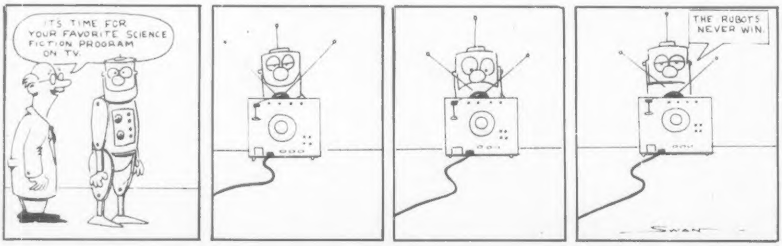
The Colossal Computer Cartoon Book

The best collection of computer cartoons ever is now in its second printing, and sports a bright new cover. The fifteen chapters contain hundreds of cartoons about robots, computer dating, computers in the office, home, and lab, and much more. 36 cartoonists share their views of man's ultimate machine.

Keep this book with your reference works. When needed, the right cartoon can say it all for you. When you need a break from debugging a good laugh can give you a welcome lift. Recommended for hours of fun and comic insight.

Edited by David Ahl, mastermind behind the April Fool's issue of Dr. Kilobyte's Creative Popular Personal Recreational Micro Computer Data Interface World Journal, this cartoon book contains much of that same incurable zaniness. [Want this issue? It's April 1980 and only $2.50 postpaid].




ITS TIME FOR YOUR FAVORITE SCIENCE FICTION PROGRAM ON TV.
THE ROBOTS NEVER WIN.
SWAN

To order, send $4.95 plus $2.00 shipping and handling to Creative Computing Press, P.O. Box 789-M, Morristown, N.J. Or call in your MasterCard, Visa, or American Express order toll free: 800-631-8112 (N.J.(201)-540-0445).

A large 8½ x 11" softbound collection of 120 pages, it still sells for only $4.95. (6G).

CIRCLE 350 ON READER SERVICE CARD

Get 12 issues of Creative Computing for the price of 8.

Some things are still cheaper by the dozen.

When you subscribe to *Creative Computing*, you get 12 issues for just $20. The same 12 issues would cost you $30 at the newsstand.

Why not enjoy *Creative Computing* all year long and save $10 at the same time.

To subscribe, call toll-free from 9 AM to 6 PM 800-631-8112. In New Jersey, call 201-540-0445. Or write to Creative Computing, Morris Plains, NJ 07950. We accept Visa, MasterCard and American Express.

Creative Computing is the leading magazine of small computer applications and software. It has in-depth reviews of new systems, peripherals and software. Also articles for both beginners and experts; columns about popular computers, programming techniques and new products; and complete program listings for your computer.

Alvin Toffler says, "I read *Creative Computing* not only for information about how to make the most of my own equipment but to keep an eye on how the whole field is emerging."

Why not join over 90,000 subscribers and save money at the same time? If you're clever enough to order a dozen.

creative computing
March
vol 7,
the #1 magazine of computer applications and software
Emphasis on Education
Simulation of Competitive Business
MECC: An In-depth Report
Seymour Papert: Mindstorms
How to Select a Computer
How to Solve It
CAI Is Not Always Drill
Reading Level
Evaluation of
Commercial
25 Fantastic New Products from the Consumer Electronics Show

Conclusion

This program, unlike other Adventures, contains no random events. The emphasis is on determining optimum move scenarios, resulting in minimum times and resource use. Each location described corresponds to an actual moon location taken from a *National Geographic* map of the moon.

The author wishes you many happy hours of exploration. As a benchmark, the author's best survival time is 385 minutes, with a four-item carry limit. Here's to your survival! ☐

Conversion to Other Basics

Conversion will be required in the manipulation of the definition and manipulation of the string variables: T$, C$, B$ and D$, depending on the manufacturer's Basic. The variables have the following string lengths: T$, 40, C$, 3, B$, 18 (default); and D$, 1. Refer to statements 10, 40, 50, 1060, 2370, 2690, 4590-4640. For example, the following, on statement 4640, references the J+1 character (from the left) of the string B$, for a length of 3:

LET C$=STR(B$,J+1,3)

Suggested changes to convert "Survival" to TRS-80 Level II and Disk Basic.

```
10 CLEAR 2000 : DIM T$(47)
40 REM * OMIT THIS LINE *
50 REM * OMIT THIS LINE *
90 CLS : PRINT"WELCOME TO THE GAME OF SURVIVAL. WOULD"
110 D$=INKEY$:IF D$="" THEN 110 ELSE PRINT D$
650 CLS : PRINT"ELAPSED TIME: ";T1;" MINUTES"
690 IF O(11)=99 AND P1>5 THEN P1=P1-5
700 IF O(14)=99 AND P2>5 THEN P2=P2-5
710 IF O(11)=99 AND P1=0 THEN 3680
720 IF O(14)=99 AND P2=0 THEN 3680
1320 LET C$=LEFT$(B$,3)
2220 PRINT "I DON'T RECOGNIZE "; RIGHT$(B$,LEN(B$)-J);"."
2370 PRINT "THERE IS NO "; RIGHT$(B$,LEN(B$)-J);" HERE!"
2690 PRINT "YOU DON'T HAVE "; RIGHT$(B$,LEN(B$)-J);"!"
3000 D$=INKEY$:IF D$="" THEN 3000 ELSE PRINT D$
4600 IF MID$(B$,J,1)=" " THEN 4640
4640 LET C$=MID$(B$,J+1,3)
```

In lines 4660 to 4840, change all single quotes (') to double quotes (").

```
4980 PRINT"YOU DON'T HAVE ";RIGHT$(B$,LEN(B$)-J); "!"
```

Suggested changes to convert "Survival" to Applesoft Basic (Apple II owners may also have to shorten or reformat some of the screen text lines that extend beyond 40 characters.)

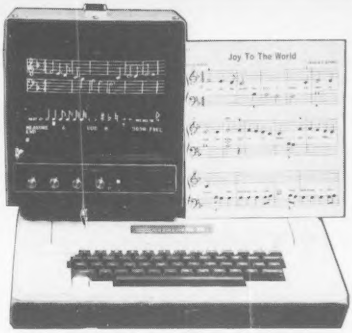
```
10 TEXT : HOME : DIM T$(47)
40 REM * OMIT THIS LINE *
50 REM * OMIT THIS LINE *
110 GET D$ : PRINT D$
650 HOME : PRINT"ELAPSED TIME: ";T1;" MINUTES"
690 IF O(11)=99 AND P1>5 THEN P1=P1-5
700 IF O(14)=99 AND P2>5 THEN P2=P2-5
710 IF O(11)=99 AND P1=0 THEN 3680
720 IF O(14)=99 AND P2=0 THEN 3680
1320 LET C$=LEFT$(B$,3)
2220 PRINT "I DON'T RECOGNIZE "; RIGHT$(B$,LEN(B$)-J);"."
2370 PRINT "THERE IS NO "; RIGHT$(B$,LEN(B$)-J);" HERE!"
2690 PRINT "YOU DON'T HAVE "; RIGHT$(B$,LEN(B$)-J);"!"
3000 GET D$ : PRINT D$
4600 IF MID$(B$,J,1)=" " THEN 4640
4640 LET C$=MID$(B$,J+1,3)
```

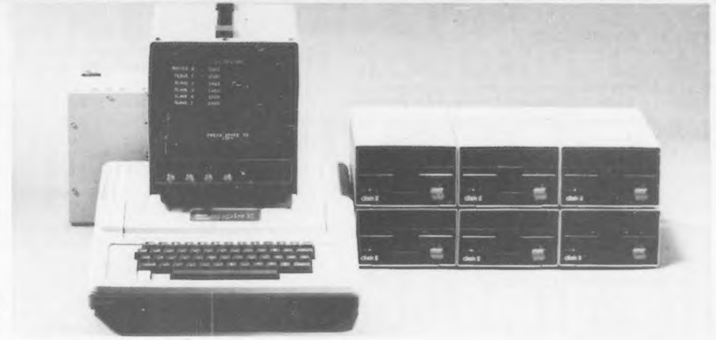
In lines 4660 to 4840, change all single quotes (') to double quotes (").

```
4980 PRINT"YOU DON'T HAVE ";RIGHT$(B$,LEN(B$)-J); "!"
```

Listing 1.

```
 10 DIM T$40 (47)
 20 DIM M(42,8)
 30 DIM O(14)
 40 DIM C$3
 50 DIM D$1
 60 REM **********************************************************
 70 REM ** INITIALIZE TEXT AND MOVE MATRICES
 80 REM **********************************************************
 90 PRINT "WELCOME TO THE GAME OF SURVIVAL. WOULD"
100 PRINT "YOU LIKE INSTRUCTIONS?"
110 INPUT D$
120 IF D$="Y" THEN GOSUB 5050
130 FOR I=1 TO 47
140 READ T$(I)
150 NEXT I
160 FOR I=1 TO 42
170 FOR J=1 TO 8
180 READ M(I,J)
190 NEXT J
200 NEXT I
210 REM **********************************************************
220 REM ** INITIALIZE OTHER PROGRAM VARIABLES
230 REM **
240 REM **  P  = CURRENT POSITION      C  = NO. OF ITEMS CARRIED
250 REM **  T1 = CURRENT ELAPSED TIME  F4 = ILLUMINATOR ON FLAG
260 REM **  T2 = OXYGEN REMAINING      F1 = METEOR SHOWER FLAG
270 REM **  F0 = OXYGEN IN USE FLAG    F2 = OPEN SHED FLAG
280 REM **  V  = VISITS TO COMP ROOM   F7 = BOMB DEACTIVATED FLAG
290 REM **  P1 = PWR IN POWER UNIT     F9 = OXYGEN REQ'D IN STATION
300 REM **  P2 = PWR IN POWER PACK
310 REM **********************************************************
320 LET P=1
330 LET C=2
340 LET T1=0          470 LET O(8)=35
350 LET T2=185        480 LET O(9)=0
360 LET P1=230        490 LET O(10)=35
370 LET P2=50         500 LET O(11)=99
380 LET V=0           510 LET O(12)=33
390 LET F0=1          520 LET O(13)=34
400 LET O(1)=21       530 LET O(14)=37
410 LET O(2)=19       540 LET M(14,4)=0
420 LET O(3)=99       550 LET M(14,8)=M(14,7)+1
430 LET O(4)=6        560 LET M(2,8)=M(2,7)+1
440 LET O(5)=32       570 LET F1=0
450 LET O(6)=0        580 LET F2=0
460 LET O(7)=38       590 LET F4=0
                      600 LET F7=0
                      610 LET F9=0
620 REM **********************************************************
630 REM ** DISPLAY CURRENT STATUS AND LOCATION INFO
640 REM **********************************************************
650 PRINT "ELAPSED TIME: "; T1; "MINUTES"
660 IF O(11)=99 THEN PRINT "POWER UNIT: "; P1; "UNITS"
670 IF O(14)=99 THEN PRINT "POWER PACK: "; P2; "UNITS"
680 LET T1=T1+5
690 IF O(11)=99 & P1>5 THEN LET P1=P1-5
700 IF O(14)=99 & P2>5 THEN LET P2=P2-5
710 IF O(11)=99 & P1=0 THEN 3680
720 IF O(14)=99 & P2=0 THEN 3680
730 IF T1>400 THEN 2960
740 IF T1>350 THEN 3840
750 IF T1>200 THEN 3740
760 IF F0=1 THEN LET T2=T2-5
770 IF T2<0 THEN LET T2=0
780 IF F0=0 THEN 800
790 IF T2>0 THEN 840
800 IF F9=0 THEN 820
810 IF P>21 THEN 2900
820 IF P<18 THEN 2900
830 IF P=38 THEN 1700
840 IF P=38 THEN 3590
850 IF F0=1 THEN PRINT "OXYGEN REMAINING: "; T2; "MINUTES"
860 PRINT "PRESENT LOCATION STATUS: YOU ARE"
870 FOR I = M(P,7) TO M(P,8)
880 PRINT T$(I)
890 NEXT I
900 PRINT "##"
910 REM **********************************************************
920 REM ** DISPLAY ANY OBJECTS PRESENT
930 REM **********************************************************
940 IF P=2 THEN 1920
950 FOR I = 1 TO 14
960 IF O(I)<>P THEN 990
970 GOSUB 4410
980 PRINT "THERE IS "; B$; " HERE."
990 NEXT I
```





IF YOU ENJOY MUSIC, WHY JUST LISTEN?

You and your Apple could be making beautiful music together!

Join the thousands of Apple owners who are making music — without the years of practice needed for conventional instruments. You can quickly and easily enter a song from sheet music. Just follow the detailed examples and instructions provided.

THE PRODUCT. ALF's economical 9-voice Music Card MC1 is just $195, the gourmet 3-voice Music Card MC16 is $245 (use 2 for 6 voices or 3 for 9). Both come with detailed manual, complete software, and cable for connection to your stereo system.

THE SOFTWARE. We're convinced our product is by far the easiest to use and most versatile system for the Apple. You get many features not available in other systems, plus a very large note capacity. And no customer has ever reported a "bug" or error.

THE HARDWARE. ALF strives for the best quality possible. No MC1 card has ever been returned with a manufacturing defect.

THE COMPANY. ALF has been making computer-controlled synthesizers since 1975. We made the first music peripheral for the Apple — and it's still one of the most popular.

Available through Apple dealers, or write for more information.

WANT TO DUPLICATE DISKS QUICKLY?

ALF's disk duplication service has been a major source of quality reproduction for Apple-compatible software houses since 1980. Now you can use the same techniques for fast and accurate reproduction yourself, with ALF's Copy System. Why spend over $10,000 for a duplication system when for just $595 you can connect the ALF Copy System to your own Apple! Copying time is about 37 to 17.3 seconds, depending on number of drives used. That's over 1,600 disks in 8 hours from a single system. Are you completely confident of your present copying methods? At ALF, accurate reproduction is more important than speed. The ALF Copy System is designed to produce perfect copies every time.

Special hardware and software copies any standard 13 or 16 sector Apple format disk. Hardware plugs easily into computer — no permanent changes required. If you wish to do your own drive maintenance, the manual tells how to use standard Shugart procedures and accessories, and all necessary software is included.

Too busy to get into disk copying? You can still count on ALF's convenient copying service. Ask about our copy-resistant and "double boot" services too!

Write for complete details.

NEED CONVENIENT FLOPPY DISK PROTECTION?

ALF's Floppy Boxes are specially designed to offer great protection with more convenient use than other methods. They're designed with two layers of corrugated cardboard with a special "cross-grain" construction for extra strength. The standard square size holds 1-3 minifloppies for mailing or packing in products. The larger rectangular size holds minifloppies plus a standard 5½ x 8½ booklet (8½ x 11 folded in half). Available with an adhesive closure tab for use as a mailer (just seal with tab, address other side, and mail). Software houses: write for details on attractive, protective packaging for your products.

Small quantity price is 75¢ for standard box.

Available singly at computer dealers, in large quantities from ALF. (New dealer inquiries invited.)

Aug. 81

A L F PRODUCTS INC. 1448 ESTES DENVER, CO 80215

The A2-3D1 Graphics Family...

professional graphics for you and your Apple II.

subLOGIC

Communications Corp.
713 Edgebrook Drive
Champaign, IL 61820
(217) 359-8482
Telex: 206995

"Apple" is the registered trademark of Apple Computer Inc.

CIRCLE 187 ON READER SERVICE CARD

Survival, continued...

```
1000 GOTO 2000
1010 REM *******************************************************
1020 REM ** READ AND PROCESS KEYBOARD RESPONSE
1030 REM *******************************************************
1040 INPUT B$
1050 LET I=0
1060 IF LEN(B$)<>1 GOTO 1320
1070 IF B$="N" THEN LET I=1
1080 IF B$="S" THEN LET I=2
1090 IF B$="E" THEN LET I=3
1100 IF B$="W" THEN LET I=4
1110 IF B$="U" THEN LET I=5
1120 IF B$="D" THEN LET I=6
1130 IF B$="Q" THEN 6200
1140 IF I=0 THEN 1570
1150 IF M(P,I)=0 THEN 1270
1160 IF M(P,I)=99 THEN 2940
1170 LET Q=M(P,I)
1180 IF P=12 THEN 3060
1190 IF P=13 THEN 3180
1200 IF P=22 THEN 3310
1210 IF P=23 THEN 3420
1220 IF P=29 THEN 3470
1230 LET R=P
1240 LET P=Q
1250 IF P=35 THEN LET V=V+1
1260 GOTO 650
1270 PRINT "YOU CANNOT GO IN THAT DIRECTION!"
1280 GOTO 1040
1290 REM *******************************************************
1300 REM ** PROCESS 2 OR MORE CHARACTER COMMANDS
1310 REM *******************************************************
1320 LET C$=B$
1330 IF C$="LOO" THEN 650
1340 IF C$="DES" THEN 650
1350 IF C$="GET" THEN 2190   1450 IF C$="DIG" THEN 1860
1360 IF C$="TAK" THEN 2190   1460 IF C$="DEB" THEN 1610
1370 IF C$="KEE" THEN 2190   1470 IF C$="FUE" THEN 4030
1380 IF C$="DRO" THEN 2580   1480 IF C$="REA" THEN 4250
1390 IF C$="LEA" THEN 2580   1490 IF C$="DEA" THEN 3890
1400 IF C$="PUT" THEN 2580   1500 IF C$="BLA" THEN 4110
1410 IF C$="INV" THEN 2780   1510 IF C$="UP" THEN 1640
1420 IF C$="QUI" THEN 6200   1520 IF C$="DOW" THEN 1640
1430 IF C$="END" THEN 6200   1530 IF C$="NOR" THEN 1640
1440 IF C$="TRA" THEN 1750   1540 IF C$="SOU" THEN 1640
                             1550 IF C$="EAS" THEN 1640
                             1560 IF C$="WES" THEN 1640

1570 PRINT "INVALID COMMAND!"
1580 GOTO 1040
1590 PRINT "I CANNOT PROCESS YOUR REQUEST!"
1600 GOTO 1040
1610 PRINT "ENTER LOCATION"
1620 INPUT P
1630 GOTO 650
1640 LET D$=B$
1650 LET B$=D$
1660 GOTO 1070
1670 REM *******************************************************
1680 REM ** PROCESS ENTRY TO HANGER FROM AIR LOCK
1690 REM *******************************************************
1700 IF R<>39 THEN 2900
1710 GOTO 840
1720 REM *******************************************************
1730 REM ** PROCESS TRANSPORT COMMAND
1740 REM *******************************************************
1750 IF P<>36 THEN 1800
1760 IF O(8)=99 THEN 1590
1770 LET P=O(8)
1780 PRINT "BEAMING IN PROCESS."
1790 GOTO 650
1800 IF P<>O(8) THEN 1590
1810 LET P=36
1820 GOTO 1780
1830 REM *******************************************************
1840 REM ** PROCESS DIG COMMAND
1850 REM *******************************************************
1860 IF P<>10 THEN 1590
1870 LET O(9)=10
1880 GOTO 940
1890 REM *******************************************************
1900 REM ** DROP ILLUMINATOR IF AT OVERLOOK
1910 REM *******************************************************
1920 IF O(4)<>99 THEN 950
1930 LET O(4)=100
1940 PRINT "YOU DROPPED YOUR ILLUMINATOR! YOU"
1950 PRINT "CANNOT RETRIEVE IT."
1960 GOTO 950
1970 REM *******************************************************
1980 REM ** PROCESS ROBOT
1990 REM *******************************************************
2000 IF O(5)=28 THEN LET O(5)=35
2010 IF O(5)=42 THEN LET O(5)=28
2020 IF O(5)=41 THEN LET O(5)=42
2030 IF O(5)=27 THEN LET O(5)=41
2040 IF O(5)=25 THEN LET O(5)=27
2050 IF O(5)<>35 THEN 2090
2060 IF P<>28 THEN 1010
2070 LET M(28,1)=35
2080 GOTO 1010
2090 IF O(5)<>32 THEN 1010
2100 IF P<>32 THEN 1010
2110 LET O(5)=25
2120·IF O(13)=99 THEN 1010
2130 PRINT "ROBOT FAILS TO RECOGNIZE YOU. IT"
2140 PRINT "FIRES A PHASOR WEAPON AT YOU!"
2150 GOTO 2980
2160 REM *******************************************************
2170 REM ** PROCESS GET OR TAKE COMMAND
2180 REM *******************************************************
2190 GOSUB 4590
2200 IF I>0 THEN 2260
2210 IF I<0 THEN 2240
2220 PRINT "I DON'T RECOGNIZE "; STR(B$,J+1); "."
2230 GOTO 1040
2240 PRINT "WHAT ITEM?"
2250 GOTO 1040
2260 IF O(I)<>P THEN 2370
2270 IF C>3 THEN 2390
2280 IF I=5 THEN 2410
2290 IF I=10 THEN 2430
2300 IF I=11 THEN 2460
2310 IF I=14 THEN 2490
2320 LET C=C+1
2330 O(I)=99
2340 IF I=3 THEN LET F0=1
2350 PRINT "O.K."
2360 GOTO 1040
2370 PRINT "THERE IS NO "; STR(B$,J+1); " HERE!"
2380 GOTO 1040
2390 PRINT "YOU CAN'T CARRY ANY MORE!"
2400 GOTO 1040
2410 PRINT "YOU CAN T CARRY A ROBOT!"
2420 GOTO 1040
2430 PRINT "YOU CAN T GET THE MESSAGE, IT'S"
2440 PRINT "ON THE TERMINAL SCREEN."
2450 GOTO 1040
2460 IF O(14)=99 THEN 2520
2470 O(11)=99
2480 GOTO 2320
2490 IF O(11)=99 THEN 2520
2500 O(14)=99
2510 GOTO 2320
2520 PRINT "YOU CAN'T HAVE MORE THAN ONE"
2530 PRINT "POWER SUPPLY."
2540 GOTO 1040
2550 REM *******************************************************
2560 REM ** PROCESS DROP OR LEAVE COMMAND
2570 REM *******************************************************
2580 GOSUB 4590
2590 IF I>0 THEN 2620
2600 IF I<0 THEN 2240
2610 GOTO 2220
2620 IF O(I)<>99 THEN 2690
2630 LET C=C-1
2640 O(I)=P
2650 IF I=3 THEN LET F0=0
2660 IF I=11 THEN 2710
2670 IF I=14 THEN 2710
2680 GOTO 2350
2690 PRINT "YOU DON'T HAVE "; STR(B$,J+1); "!"
2700 GOTO 1040
2710 IF P<22 THEN 2870
2720 IF P=38 THEN 2870
2730 IF F9=1 THEN 2870
2740 GOTO 2350
2750 REM *******************************************************
2760 REM ** PROCESS INVENTORY COMMAND
2770 REM *******************************************************
2780 FOR I=1 TO 14
2790 IF O(I)<>99 THEN 2820
2800 GOSUB 4410
2810 PRINT "YOU HAVE "; B$; "."
2820 NEXT I
2830 GOTO 1040
2840 REM *******************************************************
2850 REM ** PROGRAM TERMINATION PROCESSING
2860 REM *******************************************************
```

THE ORIGINAL MAGAZINE FOR OWNERS OF THE TRS-80™* MICROCOMPUTER

* TRS-80™ IS A TRADEMARK OF TANDY CORP

SOFTWARE FOR TRS-80™ OWNERS

H & E COMPUTRONICS INC.

MONTHLY NEWSMAGAZINE FOR TRS-80™ OWNERS

MONTHLY NEWSMAGAZINE

Practical Support For Model I, II & III

- PRACTICAL APPLICATIONS
- BUSINESS
- GAMBLING • GAMES
- EDUCATION
- PERSONAL FINANCE
- BEGINNER'S CORNER
- NEW PRODUCTS
- SOFTWARE EXCHANGE
- MARKET PLACE
- QUESTIONS AND ANSWERS
- PROGRAM PRINTOUTS

. . . . AND MORE

ALL PRICES AND SPECIFICATIONS SUBJECT TO CHANGE

NOW IN OUR 4th YEAR

PROGRAMS AND ARTICLES PUBLISHED IN RECENT ISSUES INCLUDE THE FOLLOWING:

- FINCALC - A COMPLETE FINANCIAL APPLICATIONS PACKAGE
- INFORMATION SYSTEM REVIEW
- STATISTICAL COMBINATIONS
- PASCAL'S TRIANGLE
- ASSEMBLY LANGUAGE FOR BEGINNERS
- DISK FILES
- MOD III REVIEW
- KEYBOARD THUNDER AND LIGHTING EXPLAINED
- DOS COMMANDS IN LEVEL II
- PROBABILITY CURVE GENERATOR
- CALCULATOR SIMULATIONS
- THE MEGABYTE GAP
- STOCKS AND BONDS
- BUDGET ANALYSIS (FOR BUSINESS AND HOME)
- NEWDOS 80 REVIEW
- DUTCHING - THE HORSE SYSTEM THAT CAN'T LOSE
- A SIMULATED GOLF GAME
- CONTINUOUS FORM SOURCES
- TAX SAVER REVIEW

. . . . . AND MORE

FREE* WITH YOUR SUBSCRIPTION OR RENEWAL

FINCALC A Complete Financial Analysis Package Used To Calculate Markup, Margin, Annuities, Compound Interest, Nominal And Effective Rates, Sinking Funds, Mortgage Calculations, Future Value, Savings and Insurance, Percentage Difference Between Two Numbers, Amortization Schedule and More . . . . . .

SEND FOR OUR NEW 64 PAGE SOFTWARE CATALOG (INCLUDING LISTINGS OF HUNDREDS OF TRS-80™ PROGRAMS AVAILABLE ON CASSETTE AND DISKETTE). $2.00 OR **FREE** WITH EACH SUBSCRIPTIONS OR SAMPLE ISSUE

* All programs are supplied on cassette (add $3 for Diskette Version - add $5 for modified Mod-II Version).

H & E COMPUTRONICS INC.
MATHEMATICAL APPLICATIONS SERVICE™
50 N. PASCACK ROAD
SPRING VALLEY, NEW YORK 10977

ONE YEAR SUBSCRIPTION $24 . . . .
TWO YEAR SUBSCRIPTION $48 . . . .
SAMPLE OF LATEST ISSUE $ 4 . . . .
START MY SUBSCRIPTION WITH ISSUE . . . .
(#1 - July 1978 • #12 - June 1979 • #24 - July 1980 • #30 - January 1981)
NEW SUBSCRIPTION . . . . RENEWAL . . . .

NEW TOLL-FREE ORDER LINE
(OUTSIDE OF N.Y. STATE)
(800) 431-2818

NEW!!! MOD-II NEWSLETTER $18/year (or 12 issues)

24 HOUR ORDER LINE
(914) 425-1535

CREDIT CARD NUMBER ______________________ EXP. DATE ____________
SIGNATURE ______________________ NAME ______________________
ADDRESS ____________ CITY ____________ STATE ________ ZIP ________

*** ADD $12 YEAR (CANADA, MEXICO) - ADD $24 YEAR AIR MAIL - OUTSIDE OF U.S.A., CANADA & MEXICO ***

CIRCLE 137 ON READER SERVICE CARD

Survival, continued...

```
2870 PRINT "YOU HAVE NO POWER OR POWER PACK."
2880 PRINT "YOU HAVE FROZEN TO DEATH."
2890 GOTO 2980
2900 PRINT "OXYGEN REQUIRED HERE, NONE AVAILABLE."
2910 GOTO 2980
2920 PRINT "A NUCLEAR DETONATION HAS JUST OCCURRED."
2930 GOTO 2980
2940 PRINT "YOU HAVE FALLEN TO  YOUR  DEATH."
2950 GOTO 2980
2952 PRINT "YOU HAVE BEEN ZAPPED BY THE LASER."
2954 GOTO 2980
2960 PRINT "THE MOON BASE HAS JUST BEEN DESTROYED"
2970 PRINT "BY A LARGE ASTEROID."
2980 PRINT "YOU HAVE FAILED TO SURVIVE."
2990 PRINT "DO YOU WISH TO TRY AGAIN?"
3000 INPUT D$
3010 IF D$="Y" THEN 320
3020 GOTO 6200
3030 REM *********************************************************
3040 REM ** PROCESS METEOR SHOWER
3050 REM *********************************************************
3060 IF M(P,I)<>13 THEN 1230
3070 IF F2=1 THEN 1230
3080 PRINT "THERE IS A METEOR SHOWER, YOUR SPACE"
3090 PRINT "SUIT HAS DEVELOPED A LEAK!"
3100 GOSUB 4890
3110 IF I<>2 THEN 2980
3120 PRINT "YOUR SUIT IS NOW SEALED."
3130 LET F2=1
3140 GOTO 1230
3150 REM *********************************************************
3160 REM ** PROCESS LOCKED SHED
3170 REM *********************************************************
3180 IF M(P,I)<>22 THEN 1230
3190 IF F1=1 THEN 1230
3200 PRINT "THE SHED IS LOCKED!"
3210 GOSUB 4890
3220 IF I<>1 THEN 3260
3230 PRINT "YOU ARE IN THE SHED AIR LOCK."
3240 LET F1=1
3250 GOTO 1230
3260 PRINT "YOUR ATTEMPT FAILS."
3270 GOTO 1040
3280 REM *********************************************************
3290 REM ** PROCESS DARK VENTILATOR SHAFT
3300 REM *********************************************************
3310 IF M(P,I)<>23 THEN 1230
3320 IF F4=1 THEN 1230
3330 PRINT "IT IS DANGEROUS TO PROCEED IN THE DARK!"
3340 GOSUB 4890
3350 IF I<>4 THEN 2940
3360 PRINT "THE SHAFT IS NOW ILLUMINATED."
3370 LET F4=1
3380 GOTO 1230
3390 REM *********************************************************
3400 REM ** PROCESS SHAFT WITH NO ILLUMINATOR
3410 REM *********************************************************
3420 IF O(4)<>99 THEN 2940
3430 GOTO 1230
3440 REM *********************************************************
3450 REM ** PROCESS LASER BEAM
3460 REM *********************************************************
3470 IF M(P,I)<>37 THEN 1230
3480 IF F3=1 THEN 1230
3490 PRINT "THERE IS A LASER BEAM HERE. PASSAGE NOT"
3500 PRINT "POSSIBLE WITH BEAM PRESENT."
3510 GOSUB 4890
3520 IF I<>12 THEN 2952
3530 PRINT "THE BEAM IS NOW DEFLECTED."
3540 LET F3=1
3550 GOTO 1230
3560 REM *********************************************************
3570 REM ** PROCESS BLOWN SEAL IN SPACE STATION
3580 REM *********************************************************
3590 IF R<>29 THEN 850
3600 IF F9=1 THEN 850
3610 LET F9=1
3620 PRINT "YOU HAVE JUST BLOWN AIR SEAL IN"
3630 PRINT "SPACE STATION."
3640 GOTO 850
3650 REM *********************************************************
3660 REM ** POWER REQUIRED TESTING
3670 REM *********************************************************
3680 IF P<22 THEN 2870
3690 IF F9=1 THEN 2870
3700 GOTO 730
3710 REM *********************************************************
3720 REM ** EXPOSE DEACTIVATOR
3730 REM *********************************************************
3740 IF F5=1 THEN 760
3750 LET O(6)=14
3760 LET M(2,8)=M(2,7)
3770 LET M(14,8)=M(14,7)
3780 LET M(14,4)=2
3790 LET F5=1
3800 GOTO 760
3810 REM *********************************************************
3820 REM ** DETONATE BOMB
3830 REM *********************************************************
3840 IF F7=0 THEN 2920
3850 GOTO 760
3860 REM *********************************************************
3870 REM ** DEACTIVATE BOMB
3880 REM *********************************************************
3890 IF O(6)<>99 THEN 3940
3900 IF O(7)<>99 THEN 3980
3910 LET F7=1
3920 PRINT "BOMB IS NOW DEACTIVATED."
3930 GOTO 1040
3940 PRINT "YOU HAVE NOTHING TO DO IT WITH!"
3950 GOTO 1040
3960 PRINT "THERE IS NOTHING TO DO IT TO!"
3970 GOTO 1040
3980 PRINT "YOU CAN'T DO IT FROM HERE!"
3990 GOTO 1040
4000 REM *********************************************************
4010 REM ** FUEL ROCKET
4020 REM *********************************************************
4030 IF P<>19 THEN 3980
4040 IF O(9)<>99 THEN 3940
4050 LET O(9)=98
4060 PRINT "FUEL IS NOW LOADED."
4070 GOTO 1040
4080 REM *********************************************************
4090 REM ** BLASTOFF PROCESSING
4100 REM *********************************************************
4110 IF P<>21 THEN 3980
4120 IF O(9)<>98 THEN 4200
4130 IF F7=1 THEN 4160
4140 PRINT "REPAIRS NOT YET COMPLETE."
4150 GOTO 1040
4160 PRINT "CONGRATULATIONS. YOU HAVE JUST BLASTED"
4170 PRINT "OFF AND ARE ON YOUR WAY TO EARTH."
4180 PRINT "YOUR   ESCAPE TIME:"; T1; "MINUTES."
4190 GOTO 2990
4200 PRINT "YOU'RE SPACE CRAFT HAS NO FUEL!"
4210 GOTO 1040
4220 REM *********************************************************
4230 REM ** COMPUTER READOUT PROCESSING
4240 REM *********************************************************
4250 IF P<>35 THEN 3980
4260 GOSUB 4590
4270 IF I<>10 THEN 3960
4280 IF V<>0 THEN 4320
4290 PRINT "BOMB DE-ACTIVATOR LOCATED SOMEWHERE EAST"
4300 PRINT "OF SPACE STATION, ON MOON'S SURFACE."
4310 GOTO 4360
4320 IF V<>1 THEN 4350
4330 PRINT "LOCAL FUEL SOURCE: DILITHIUM CRYSTAL."
4340 GOTO 4360
4350 PRINT "DILITHIUM FOUND IN SOFT SURFACES."
4360 IF F7=1 THEN PRINT "SPACECRAFT REPAIRS COMPLETED."
4370 GOTO 1040
4380 REM *********************************************************
4390 REM ** SUBROUTINE TO DESCRIBE ITEMS AT LOCATION
4400 REM *********************************************************
4410 IF I= 1 THEN LET B$="AN ELECTRONIC KEY"
4420 IF I= 2 THEN LET B$="SEALANT"
4430 IF I= 3 THEN LET B$="AN OXYGEN MODULE"
4440 IF I= 4 THEN LET B$="AN ILLUMINATOR"
4450 IF I= 5 THEN LET B$="A ROBOT"
4460 IF I= 6 THEN LET B$="A DEACTIVATOR"
4470 IF I= 7 THEN LET B$="A NUCLEAR BOMB"
4480 IF I= 8 THEN LET B$="A TRANSPORTER UNIT"
4490 IF I= 9 THEN LET B$="DILITHIUM CRYSTALS"
4500 IF I= 10 THEN LET B$="A COMPUTER MESSAGE"
4510 IF I= 11 THEN LET B$="A POWER UNIT"
4520 IF I= 12 THEN LET B$="A MIRROR"
4530 IF I= 13 THEN LET B$="A CODED BADGE"
4540 IF I= 14 THEN LET B$="A POWER PACK"
4550 RETURN
4560 REM *********************************************************
4570 REM ** SUBROUTINE TO CONVERT AN ITEM TO A NUMERIC VALUE
4580 REM *********************************************************
4590 FOR J=1 TO LEN(B$)
4600 IF STR(B$,J,1)=" " THEN 4640
```

H & E COMPUTRONICS INC.

• EVERYTHING FOR YOUR TRS-80* • ATARI* • APPLE* • PET* •

*TRS-80 is a trademark of the Radio Shack Division of Tandy Corp. - *ATARI is a trademark of Atari Inc. - *Apple is a trademark of Apple Corp. - *Pet is a trademark of Commodore

NEW

★ All orders processed within 24-Hours
★ 30-Day money back guarantee on all Software (less a $3 penalty for handling)

BUSINESS PAC 100

100 Ready-To-Run Business Programs

(ON CASSETTE OR DISKETTE).....Includes 110 Page Users Manual.....5 Cassettes (Or Diskettes)
Inventory Control.....Payroll.....Bookkeeping System.....Stock Calculations.....
Checkbook Maintenance.....Accounts Receivable.....Accounts Payable.....

BUSINESS 100 PROGRAM LIST

NAME	DESCRIPTION
1 RULE78	Interest Apportionment by Rule of the 78's
2 ANNU1	Annuity computation program
3 DATE	Time between dates
4 DAYYEAR	Day of year a particular date falls on
5 LEASEINT	Interest rate on lease
6 BREAKEVN	Breakeven analysis
7 DEPRSL	Straightline depreciation
8 DEPRSY	Sum of the digits depreciation
9 DEPRDB	Declining balance depreciation
10 DEPRDDB	Double declining balance depreciation
11 TAXDEP	Cash flow vs. depreciation tables
12 CHECK2	Prints NEBS checks along with daily register
13 CHECKBK1	Checkbook maintenance program
14 MORTGAGE/A	Mortgage amortization table
15 MULTMON	Computes time needed for money to double, triple, etc.
16 SALVAGE	Determines salvage value of an investment
17 RRVARIN	Rate of return on investment with variable inflows
18 RRCONST	Rate of return on investment with constant inflows
19 EFFECT	Effective interest rate of a loan
20 FVAL	Future value of an investment (compound interest)
21 PVAL	Present value of a future amount
22 LOANPAY	Amount of payment on a loan
23 REGWITH	Equal withdrawals from investment to leave 0 over
24 SIMPDISK	Simple discount analysis
25 DATEVAL	Equivalent & nonequivalent dated values for oblig.
26 ANNUDEF	Present value of deferred annuities
27 MARKUP	% Markup analysis for items
28 SINKFUND	Sinking fund amortization program
29 BONDVAL	Value of a bond
30 DEPLETE	Depletion analysis
31 BLACKSH	Black Scholes options analysis
32 STOCVAL1	Expected return on stock via discounts dividends
33 WARVAL	Value of a warrant
34 BONDVAL2	Value of a bond
35 EPSEST	Estimate of future earnings per share for company
36 BETAALPH	Computes alpha and beta variables for stock
37 SHARPE1	Portfolio selection model-i.e. what stocks to hold
38 OPTWRITE	Option writing computations
39 RTVAL	Value of a right
40 EXPVAL	Expected value analysis
41 BAYES	Bayesian decisions
42 VALPRINF	Value of perfect information
43 VALADINF	Value of additional information
44 UTILITY	Derives utility function
45 SIMPLEX	Linear programming solution by simplex method
46 TRANS	Transportation method for linear programming
47 EOQ	Economic order quantity inventory model
48 QUEUE1	Single server queueing (waiting line) model
49 CVP	Cost-volume-profit analysis
50 CONDPROF	Conditional profit tables
51 OPTLOSS	Opportunity loss tables
52 FQUOQ	Fixed quantity economic order quantity model
53 FQEOWSH	As above but with shortages permitted
54 FQEOQPB	As above but with quantity price breaks
55 QUEUECB	Cost-benefit waiting line analysis
56 NCFANAL	Net cash-flow analysis for simple investment
57 PROFIND	Profitability index of a project
58 CAP1	Cap. Asset Pr. Model analysis of project
59 WACC	Weighted average cost of capital
60 COMPBAL	True rate on loan with compensating bal. required
61 DISCBAL	True rate on discounted loan
62 MERGANAL	Merger analysis computations
63 FINRAT	Financial ratios for a firm
64 NPV	Net present value of project
65 PRINDLAS	Laspeyres price index
66 PRINDPA	Paasche price index
67 SEASIND	Constructs seasonal quantity indices for company
68 TIMETR	Time series analysis linear trend
69 TIMEMOV	Time series analysis moving average trend
70 FUPRINF	Future price estimation with inflation
71 MAILPAC	Mailing list system
72 LETWRT	Letter writing system-links with MAILPAC
73 SORT3	Sorts list of names
74 LABEL1	Shipping label maker
75 LABEL2	Name label maker
76 BUSBUD	DOME business bookkeeping system
77 TIMECLCK	Computes weeks total hours from timeclock info.
78 ACCTPAY	In memory accounts payable system-storage permitted
79 INVOICE	Generate invoice on screen and print on printer
80 INVENT2	In memory inventory control system
81 TELDIR	Computerized telephone directory
82 TIMUSAN	Time use analysis
83 ASSIGN	Use of assignment algorithm for optimal job assign.
84 ACCTREC	In memory accounts receivable system-storage ok
85 TERMSPAY	Compares 3 methods of repayment of loans
86 PAYNET	Computes gross pay required for given net
87 SELLPR	Computes selling price for given after tax amount
88 ARBCOMP	Arbitrage computations
89 DEPRSF	Sinking fund depreciation
90 UPSZONE	Finds UPS zones from zip code
91 ENVELOPE	Types envelope including return address
92 AUTOEXP	Automobile expense analysis
93 INSFILE	Insurance policy file
94 PAYROLL2	In memory payroll system
95 DILANAL	Dilution analysis
96 LOANAFFD	Loan amount a borrower can afford
97 RENTPRCH	Purchase price for rental property
98 SALELEAS	Sale-leaseback analysis
99 RRCONVBD	Investor's rate of return on convertable bond
100 PORTVAL9	Stock market portfolio storage-valuation program

☐ **CASSETTE VERSION**	**$99.95**
☐ **DISKETTE VERSION**	**$99.95**
☐ **TRS-80* MODEL II VERSION**	**$149.95**

ADD $2.00 FOR SHIPPING IN UPS AREAS
ADD $3.00 FOR C.O.D. OR NON-UPS AREAS
ADD $4.00 OUTSIDE U.S.A, CANADA & MEXICO

H & E COMPUTRONICS INC.
MATHEMATICAL APPLICATIONS SERVICE™

50 N. PASCACK ROAD
SPRING VALLEY, NEW YORK 10977

NEW TOLL-FREE ORDER LINE
(OUTSIDE OF N.Y. STATE)
(800) 431-2818

VISA

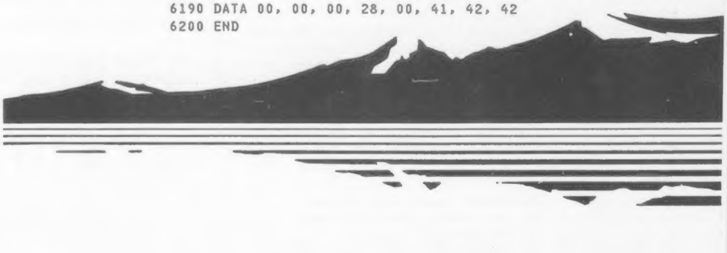
24 HOUR ORDER LINE
(914) 425-1535

master charge

CIRCLE 138 ON READER SERVICE CARD

Survival, continued...

```
4610 NEXT J
4620 I=-1
4630 RETURN
4640 LET C$=STR(B$,J+1,3)
4650 LET I=0
4660 IF C$='ELE' THEN LET I=1
4670 IF C$='KEY' THEN LET I=1
4680 IF C$='SEA' THEN LET I=2
4690 IF C$='OXY' THEN LET I=3
4700 IF C$='MOD' THEN LET I=3
4710 IF C$='ILL' THEN LET I=4
4720 IF C$='ROB' THEN LET I=5
4730 IF C$='DEA' THEN LET I=6
4740 IF C$='NUC' THEN LET I=7
4750 IF C$='BOM' THEN LET I=7
4760 IF C$='TRA' THEN LET I=8
4770 IF C$='DIL' THEN LET I=9
4780 IF C$='CRY' THEN LET I=9
4790 IF C$='COM' THEN LET I=10
4800 IF C$='MES' THEN LET I=10
4810 IF C$='UNI' THEN LET I=11
4820 IF C$='MIR' THEN LET I=12
4830 IF C$='BAD' THEN LET I=13
4840 IF C$='PAC' THEN LET I=14
4850 RETURN
4860 REM ***********************************************************
4870 REM ** SUBROUTINE TO PROCESS TRY COMMAND
4880 REM ***********************************************************
4890 INPUT B$
4900 LET C$=B$
4910 IF C$="TRY" THEN 4950
4920 IF C$="USE" THEN 4950
4930 I=-1
4940 RETURN
4950 GOSUB 4590
4960 IF I<1 THEN 5050
4970 IF O(I)=99 THEN RETURN
4980 PRINT "YOU DON'T HAVE "; STR(B$,J+1); "!"
4990 GOTO 4930
5000 PRINT "YOU'RE ATTEMPT FAILS!"
5010 GOTO 4930
5020 REM ***********************************************************
5030 REM ** PRINT INSTRUCTIONS
5040 REM ***********************************************************
5050 PRINT "YOU HAVE CRASH LANDED ON THE  "
5060 PRINT "EARTH'S MOON. YOU HAVE LIMITED"
5070 PRINT "SUPPLIES AND TIME IN WHICH TO "
5080 PRINT "SURVIVE. TO TRAVEL, YOU MAY   "
5090 PRINT "ENTER DIRECTIVES SUCH AS NORTH"
5100 PRINT "OR N, AS WELL AS S, E, W AND  "
5110 PRINT "U, AND D (UP AND DOWN). YOU   "
5120 PRINT "WILL ENCOUNTER VARIOUS ITEMS  "
5130 PRINT "AND SITUATIONS DURING YOUR    "
5140 PRINT "TRAVELS. TO COMMUNICATE, ENTER"
5150 PRINT "COMMANDS (VERBS), FOLLOWED BY "
5160 PRINT "OBJECT NAMES, IF APPLICABLE.  "
5170 PRINT "FOR EXAMPLE, GET XXX, LEAVE,  "
5180 PRINT "USE, AND INVENTORY."
5190 PRINT " "
5200 PRINT "ONCE YOU HAVE SURVIVED, THE   "
5210 PRINT "OBJECT THEN IS TO ACHIEVE THE "
5220 PRINT "OPTIMUM SURVIVAL TIME. GOOD   "
5230 PRINT "LUCK!!!"
5240 RETURN
5250 REM ***********************************************************
5260 REM ** TEXT LOCATION DESCRIPTIONS
5270 REM ***********************************************************
5280 DATA "AT MARE SERENITATIS."
5290 DATA "ON RIM OF POSIDONIUS."
5300 DATA "TOTAL DARKNESS TO E."
5310 DATA "TWIXT DAWES & PLINIUS."
5320 DATA "AT PASS IN HAEMUS MTNS."
5330 DATA "AT CRATER MANILUS."
5340 DATA "AT MARE VAPORUM."
5350 DATA "AT MT. EUDOXUS."
5360 DATA "INSIDE ARISTOTELES."
5370 DATA "IN CHANGING AREA."
5380 DATA "IN LACUS SOMNIORUM."
5390 DATA "AT LACUS MORTIS."
5400 DATA "THE SURFACE IS VERY SOFT HERE."
5410 DATA "AT E. SIDE OF MARE IMBRIUM."
5420 DATA "AT THE BASE OF PLATO CRATER. A"
5430 DATA "SHINY OBJECT IS SEEN W."
5440 DATA "BEFORE A METAL SHED. A"
5450 DATA "SIGN READS VENT. SHAFT #2."
5460 DATA "E. OF MARE SERENITATIS."
5470 DATA "THERE IS TOTAL DARKNESS."
5480 DATA "AT CRASH SITE OF A SPACE CRAFT."
5490 DATA "THE SHIP ENTRANCE IS BEFORE YOU."
5500 DATA "AT THE CENTER OF MARE IMBRIUM."
5510 DATA "IN THE AIR LOCK CHAMBER OF THE SHIP."
5520 DATA "IN THE AFT CARGO AND FUEL STORAGE ROOM."
5530 DATA "IN THE ENGINE ROOM OF THE SPACECRAFT."
5540 DATA "IN THE SHIP'S CONTROL ROOM."
5550 DATA "IN AN AIR LOCK CHAMBER."
5560 DATA "INSIDE A VENTILLATOR SHED. A LADDER"
5570 DATA "LEADS DOWN INTO A LARGE METAL SHAFT."
5580 DATA "IN A VENTILLATOR PASSAGE."
5590 DATA "AT A VENTILLATOR OPENING. THROUGH THE"
5600 DATA "OPENING A LIT PASSAGEWAY CAN BE SEEN."
5610 DATA "IN A LIGHTED SPACE STATION CORRIDOR."
5620 DATA "IN THE SPACE STATION INFIRMARY."
5630 DATA "IN THE RECREATION ROOM AND LIBRARY."
5640 DATA "IN THE MESS HALL. ABANDONED FOOD TRAYS"
5650 DATA "ARE STILL ON THE TABLES."
5660 DATA "IN THE STORAGE ROOM AND SUPPLY AREA."
5670 DATA "IN THE SLEEPING QUARTERS."
5680 DATA "IN AN ELEVATOR AT SUBSURFACE LEVEL."
5690 DATA "IN AN ELEVATOR AT SURFACE LEVEL."
5700 DATA "IN THE STATION CONTROL CENTER."
5710 DATA "IN THE TRANSPORTER ROOM."
5720 DATA "IN THE SPACE STATION LABORATORY."
5730 DATA "IN THE HANGAR AREA. THE LAUNCH AREA"
5740 DATA "IS JUST SOUTH OF HERE."
5750 REM **
5760 REM ** MOVEMENT AND TEXT POINTER MATRIX
5770 REM **
5780 DATA 07, 04, 02, 15, 00, 00, 01, 01
5790 DATA 09, 03, 14, 01, 00, 00, 02, 03
5800 DATA 02, 05, 14, 04, 00, 00, 04, 04
5810 DATA 01, 05, 03, 00, 00, 00, 05, 05
5820 DATA 04, 00, 03, 06, 00, 00, 06, 06
5830 DATA 00, 00, 05, 00, 00, 00, 07, 07
5840 DATA 08, 01, 09, 11, 00, 00, 08, 08
5850 DATA 00, 07, 10, 00, 00, 00, 09, 09
5860 DATA 10, 02, 14, 07, 00, 00, 11, 11
5870 DATA 00, 09, 14, 08, 00, 00, 12, 13
5880 DATA 12, 15, 07, 16, 00, 00, 14, 14
5890 DATA 00, 11, 00, 13, 00, 00, 15, 16
5900 DATA 00, 16, 12, 22, 00, 00, 17, 18
5910 DATA 99, 99, 99, 99, 00, 00, 19, 20
5920 DATA 11, 18, 01, 00, 00, 00, 21, 22
5930 DATA 17, 16, 07, 16, 00, 00, 23, 23
5940 DATA 16, 17, 11, 17, 00, 00, 23, 23
5950 DATA 15, 19, 00, 00, 00, 00, 24, 24
5960 DATA 18, 00, 20, 00, 00, 00, 25, 25
5970 DATA 00, 00, 00, 19, 21, 00, 26, 26
5980 DATA 00, 00, 00, 00, 00, 20, 27, 27
5990 DATA 00, 00, 13, 00, 00, 23, 29, 30
6000 DATA 24, 00, 00, 00, 22, 00, 31, 31
6010 DATA 25, 23, 00, 00, 00, 00, 32, 33
6020 DATA 27, 26, 33, 32, 24, 00, 34, 34
6030 DATA 25, 00, 30, 31, 00, 00, 34, 34
6040 DATA 34, 25, 41, 00, 00, 00, 34, 34
6050 DATA 00, 29, 42, 36, 00, 00, 34, 34
6060 DATA 28, 38, 40, 37, 00, 00, 34, 34
6070 DATA 00, 00, 00, 26, 00, 00, 35, 35
6080 DATA 00, 00, 26, 00, 00, 00, 36, 36
6090 DATA 00, 00, 25, 00, 00, 00, 37, 38
6100 DATA 00, 00, 00, 25, 00, 00, 40, 40
6110 DATA 00, 27, 00, 00, 00, 00, 39, 39
6120 DATA 00, 28, 00, 00, 24, 00, 43, 43
6130 DATA 00, 00, 28, 00, 00, 00, 44, 44
6140 DATA 00, 00, 29, 00, 00, 00, 45, 45
6150 DATA 29, 00, 39, 00, 00, 00, 46, 47
6160 DATA 40, 00, 00, 38, 00, 00, 28, 28
6170 DATA 00, 39, 00, 29, 00, 00, 10, 10
6180 DATA 00, 00, 00, 27, 42, 00, 41, 41
6190 DATA 00, 00, 00, 28, 00, 41, 42, 42
6200 END
```



Listing 2. Option for Shortened Text.

```
5250 REM **********************************************************
5260 REM ** TEXT LOCATION DESCRIPTIONS - SHORTENED FORM
5270 REM **********************************************************
5280 DATA "AT MARE SERENITATIS."
5290 DATA "ON RIM OF POSIDONIUS."
5300 DATA "TOTAL DARKNESS TO E."
5310 DATA "TWIXT DAWES & PLINIUS."
5320 DATA "AT PASS IN HAEMUS MTNS."
5330 DATA "AT CRATER MANILUS."
5340 DATA "AT MARE VAPORUM."
5350 DATA "AT MT. EUDOXUS."
5360 DATA "INSIDE ARISTOTELES."
5370 DATA "IN CHANGING AREA."
5380 DATA "IN LACUS SOMNIORUM."
5390 DATA "AT LACUS MORTIS."
5400 DATA "THE SURFACE IS VERY SOFT HERE."
5410 DATA "AT E. SIDE OF MARE IMBRIUM."
5420 DATA "AT THE BASE OF PLATO CRATER. A"
5430 DATA "SHINY OBJECT IS SEEN W."
5440 DATA "BEFORE A METAL SHED. A"
5450 DATA "SIGN READS VENT. SHAFT #2."
5460 DATA "E. OF MARE SERENITATIS."
5470 DATA "THERE IS TOTAL DARKNESS."
5480 DATA "AT CRASH SITE OF A SPACE CRAFT."
5490 DATA "THE SHIP ENTRANCE IS BEFORE YOU."
5500 DATA "AT THE CENTER OF MARE IMBRIUM."
5510 DATA "IN THE AIR LOCK CHAMBER OF THE SHIP."
5520 DATA "IN THE AFT CARGO AND FUEL STORAGE ROOM."
5530 DATA "IN THE ENGINE ROOM OF THE SPACECRAFT."
5540 DATA "IN THE SHIP'S CONTROL ROOM."
5550 DATA "IN AN AIR LOCK CHAMBER."
5560 DATA "INSIDE A VENTILLATOR SHED. A LADDER"
5570 DATA "LEADS DOWN INTO A LARGE METAL SHAFT."
5580 DATA "IN A VENTILLATOR PASSAGE."
5590 DATA "AT A VENTILLATOR OPENING. THROUGH THE"
5600 DATA "OPENING A LIT PASSAGEWAY CAN BE SEEN."
5610 DATA "IN A LIGHTED SPACE STATION CORRIDOR."
5620 DATA "IN THE SPACE STATION INFIRMARY."
5630 DATA "IN THE RECREATION ROOM AND LIBRARY."
5640 DATA "IN THE MESS HALL. ABANDONED FOOD TRAYS"
5650 DATA "ARE STILL ON THE TABLES."
5660 DATA "IN THE STORAGE ROOM AND SUPPLY AREA."
5670 DATA "IN THE SLEEPING QUARTERS."
5680 DATA "IN AN ELEVATOR AT SUBSURFACE LEVEL."
5690 DATA "IN AN ELEVATOR AT SURFACE LEVEL."
5700 DATA "IN THE STATION CONTROL CENTER."
5710 DATA "IN THE TRANSPORTER ROOM."
5720 DATA "IN THE SPACE STATION LABORATORY."
5730 DATA "IN THE HANGAR AREA. THE LAUNCH AREA"
5740 DATA "IS JUST SOUTH OF HERE."
5750 REM **
5760 REM ** MOVEMENT AND TEXT POINTER MATRIX FOR SHORTENED TEXT
5770 REM **
5780 DATA 07, 04, 02, 15, 00, 00, 01, 01
5790 DATA 09, 03, 14, 01, 00, 00, 02, 03
5800 DATA 02, 05, 14, 04, 00, 00, 04, 04
5810 DATA 01, 05, 03, 00, 00, 00, 05, 05
5820 DATA 04, 00, 03, 06, 00, 00, 06, 06
5830 DATA 00, 00, 05, 00, 00, 00, 07, 07
5840 DATA 08, 01, 09, 11, 00, 00, 08, 08
5850 DATA 00, 07, 10, 00, 00, 00, 09, 09
5860 DATA 10, 02, 14, 07, 00, 00, 11, 11
5870 DATA 00, 09, 14, 08, 00, 00, 12, 13
5880 DATA 12, 15, 07, 16, 00, 00, 14, 14
5890 DATA 00, 11, 00, 13, 00, 00, 15, 16
5900 DATA 00, 16, 12, 22, 00, 00, 17, 18
5910 DATA 99, 99, 99, 99, 00, 00, 19, 20
5920 DATA 11, 18, 01, 00, 00, 00, 21, 22
5930 DATA 17, 16, 07, 16, 00, 00, 23, 23
5940 DATA 16, 17, 11, 17, 00, 00, 23, 23
5950 DATA 15, 19, 00, 00, 00, 00, 24, 24
5960 DATA 18, 00, 20, 00, 00, 00, 25, 25
5970 DATA 00, 00, 00, 19, 21, 00, 26, 26
5980 DATA 00, 00, 00, 00, 00, 20, 27, 27
5990 DATA 00, 00, 13, 00, 00, 23, 29, 30
6000 DATA 24, 00, 00, 00, 22, 00, 31, 31
6010 DATA 25, 23, 00, 00, 00, 00, 32, 33
6020 DATA 27, 26, 33, 32, 24, 00, 34, 34
6030 DATA 25, 00, 30, 31, 00, 00, 34, 34
6040 DATA 34, 25, 41, 00, 00, 00, 34, 34
6050 DATA 00, 29, 42, 36, 00, 00, 34, 34
6060 DATA 28, 38, 40, 37, 00, 00, 34, 34
6070 DATA 00, 00, 00, 26, 00, 00, 35, 35
6080 DATA 00, 00, 26, 00, 00, 00, 36, 36
6090 DATA 00, 00, 25, 00, 00, 00, 37, 38
6100 DATA 00, 00, 00, 25, 00, 00, 40, 40
6110 DATA 00, 27, 00, 00, 00, 00, 39, 39
6120 DATA 00, 28, 00, 00, 24, 00, 43, 43
6130 DATA 00, 00, 28, 00, 00, 00, 44, 44
6140 DATA 00, 00, 29, 00, 00, 00, 45, 45
6150 DATA 29, 00, 39, 00, 00, 00, 46, 47
6160 DATA 40, 00, 00, 38, 00, 00, 28, 28
6170 DATA 00, 39, 00, 29, 00, 00, 10, 10
6180 DATA 00, 00, 00, 27, 42, 00, 41, 41
6190 DATA 00, 00, 00, 28, 00, 41, 42, 42
```

I(nterchange)

I(nterchange) is a general purpose file maintenance program for use with the CP/M™ operating system. Since it is a single program written in optimized Z-80™ code, it is much faster and easier to use than other file maintenance programs. Features include: DIR as usual *plus* listing all files *excluding* those with a specified character(s), ERA as usual plus *exclusive* erases. Also, a "Q" switch can be used to query each erase, a "W" allows erases of R/O files without query (normally you are queried), and an "R" switch if system files are to be included, LIST permits listings and uses TAB, WIDTH, LINES and WRAP for control, COPY as usual plus *exclusive* copies and supports the "Q", "W" and "R" switches plus an "E" switch for query on existing files, STAT with ambiguous, unambiguous and exclusive listings and produces an alphabetized listing with file length, total directory entries and space used and unused, START-END allows for copying contiguous data files, and RENAME as usual plus ambiguous renames. Other commands include: QT, DATE, TIME and SETIT (for the QT clock board) plus CLEAR, RESET, HELP and TYPE. Disk copies can even be continued after a disk full condition by simply inserting a new disk. All of this in one program without ever having to leave I(nterchange) and wait until you see the speed improvement . . .

The price for I(nterchange) is $59.95 and the manual is available for $10.00 (credited towards purchase). I(nterchange) is recommended for 32K or larger systems using CP/M™ 2.0 or later. It will not run on an 8080 CPU and only User 0 is supported.

All programs are available on 8" SD or North Star 5¼" disk. Microstat is available for North Star Basic, Microsoft's Basic-80 (Rel. 5.0 or later) or compiler Systems CBasic2. Please specify when ordering.

CP/M is a registered trademark of Digital Research.

ECOSOFT, INC.
P.O. BOX 68602
INDIANAPOLIS, IN 46268-0602
(317) 283-8883

master charge

VISA

CIRCLE 154 ON READER SERVICE CARD

The Second Annual International Computer Problem Solving Contest

Donald T. Piele

It is time once again to extend an invitation to schools throughout the United States and around the world to participate in the Annual International Computer Problem Solving Contest sponsored by the University of Wisconsin-Parkside. This contest is a team competition for elementary and secondary school students that emphasizes the role of problem solving in computer programming.

It is a timed competition that challenges each team to solve five problems within a two hour time limit. The results are judged locally at each school or contest site with the aid of a set of sample solutions that we provide. Each program must run correctly using the test data supplied in the problem to receive any points. The local contest results that are returned to us will be analyzed further to determine a world wide ranking of the top ten teams.

The contest problems are available free of charge to any school or organization that sends in an application before March 27, 1982. The date of this year's contest has been set for Saturday, April 17, 1982. Here is how you can get involved.

Registration

To become a local contest site, a school or organization should complete the application form shown here. Each local contest should have a contest director and a contest duplicator. The contest director is the person responsible for organizing and running the local contest. The contest duplicator is the one responsible for making the required number of copies of the problems for the local contest. This person should be someone who is not involved in the teaching or coaching of students entered in the contest.

About three weeks before April 17—the day of the contest—we mail one copy of the contest problems. Other than the contest duplicator, no one may see the problems before April 17. On the day of the contest, they are to be delivered to the contest director who may share them with the judges before the contest begins.

All applications should be accompanied by a large (9x12 inch) envelope addressed to the contest duplicator. If the entry is from a school or organization inside the United States, please include four 20-cent stamps. We will provide the postage for entries from outside the United States. Send to:

Dr. D.T. Piele
The University of Wisconsin-Parkside
P.O. Box 2000
Kenosha, WI 53141

Previous Contest Problems

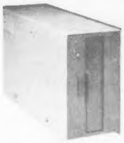
This is the sixth year that we have held a local contest and the second year for the international event. As a result, we now have six Junior and six Senior contest problem sets that we have used. Since this is the first year for the Elementary Division, we do not have any problems at this level. For those who would like to see what kinds of problems have been used before, the problem sets for the last three contests can be found in *Creative Computing* (Sept. 1979, p. 152-153; Feb. 1981, p. 86-92; Oct. 1981, p. 140-148). If you would like to receive the complete set of all twelve problem sets, please send a self-addressed 9x12 envelope with four 20-cent stamps.

John Rompel-Junior Division Winner. Piedmont Middle School, Piedmont, CA.

Donald T. Piele, Department of Mathematics, The University of Wisconsin-Parkside, Kenosha, WI 53141.

WE WILL NOT BE UNDERSOLD

DISK DRIVES



FOR TRS-80* Model I

CCI-100	5¼″, 40 Track (102K)	$299

ADD-ON DRIVES FOR ZENITH Z-89

CCI-189	5¼″, 40 Track (102K)	$389
Z-87	Dual 5¼″ system	$995

External card edge and power supply included. 90 day warranty/one year on power supply.

CORVUS	5mg **$3089**	10mg **$4489**	Mirror	**$699**
RAW DRIVES	8″ SHUGART 801R			**$399**
5¼″ TANDON	**$ CALL**		POWER SUPPLIES	**$ CALL**

DISKETTES — Box of 10

5¼″	**Maxell $40**		**BASF/Verbatim**	**$26.95**
8″	**Maxell $45**		**BASF/Verbatim**	**$36.00**
PLASTIC FILE BOX–Holds 50 5¼″ diskettes				**$19.00**
PLASTIC LIBRARY CASE	5¼″ **$3.00**		8″	**$ 4.00**
HEAD CLEANING DISKETTE				**$25.00**
FLOPPY SAVER	**$10.95**		RINGS	**$ 6.95**

16K RAM KITS

2 for $37 **$19**

200ns for TRS-80,*Apple II, (specify): **Jumpers $2.50**

COMPUTERS/SYSTEMS

ALTOS	ACS8000 Series		**$CALL**
ZENITH	48K, all-in-one computer		**$2149**
ATARI	400 **$ 359**	800	**$ 789**
MATTEL	INTELLIVISION		**$ 259**
APPLE PERIPHERALS			**$CALL**

TERMINALS

ADDS	Viewpoint			**$CALL**
ZENITH	Z-19			**$ 725**
TELEVIDEO	910 **$ 559**	920C **$729**	950	**$ 929**
IBM	3101-10			**$1189**

S-100 CALIFORNIA COMPUTER SYSTEMS

MAINFRAME	**$349**	**Z80 CPU**	**$ 239**
64K RAM	**$569**	**FLOPPY DISC CNTRL**	**$ 339**

INTEGRATED SYSTEM W/INTERNAL CABLES, TESTED	**$1975**
2P + 2S I/O	**$ 269**
4 PORT SERIAL I/O	**$ 249**
4 PORT PARALLEL I/O	**$ 179**
CABLES	**$CALL**

CASIO CALCULATORS

POCKET COMPUTER	FX702	**$199.00**
DESK PRINTER/CALCULATOR	FR100	**$ 79.95**
SCIENTIFIC CALCULATOR	FX8100	**$ 49.95**
GAME WATCH	CA90 Plastic	**$ 49.95**
GAME WATCH	CA901 Steel	**$ 69.95**
SPORT WATCH	AX210 Calendar	**$ 59.95**

BUSINESS SOFTWARE

WORDSTAR for Apple II	**$ 329**
WORDSTAR for Zenith Z89	**$ 329**

PRINTERS

NEC SPINWRITER

7710 R.O. Par	**$2395**
7710 R.O. Par w/tractor	**$2595**
7720 KSR w/tractor	**$2795**
7730 R.O. Ser	**$2395**
7730 R.O. Ser w/tractor	**$2595**
NEW 3500 Series	**$CALL**

EPSON	MX-70	MX-80	MX-80FT	MX100	**$CALL**

PAPER TIGER

IDS 445	Graphics & 2K buffer	**$ 639**
IDS 460	Graphics & 2K buffer	**$ 799**
IDS 560	Graphics	**$1049**
ACCESSORIES		**$CALL**

ANADEX	DP-8000	**$849**	DP-9500/01	**$1389**

OKIDATA

Microline 80	Friction & pin feed	**$CALL**
Microline 82	Friction & pin feed	**$CALL**
Microline 83	120 cps, uses up to 15″ paper	**$CALL**

Call for new Microline series!

CENTRONICS	739, new model with graphics	**$ 739**

C. ITOH

Starwriter I	25 cps, parallel interface	**$1525**
Starwriter I	25 cps, serial interface	**$1620**
Starwriter II	45 cps, parallel interface	**$1950**
Starwriter II	45 cps, serial interface	**$2075**
AXIOM	GP-80M	**$ 319**
DATA SOUTH	180 cps	**$CALL**

MONITORS

BELL & HOWELL	9″ B & W BHD911			**$155**
LEEDEX	12″ B & W	**$129**	12″ Green Screen	**$155**
	13″ Color	**$329**		
SANYO	9″ B & W	**$149**	12″ Green Screen	**$238**
	12″ B & W	**$219**	13″ Color	**$399**
ZENITH	13″ Color	**$349**	12″ Green Screen	**$129**

TELECOMMUNICATIONS

PRENTICE STAR MODEM	1-year guarantee			**$125**
UNIVERSAL DATA SYSTEMS	UDS103LP	**$149**	UDS103JP	**$215**
NOVATION	CAT	**$139**	D-CAT	**$149**
	AUTO-CAT	**$199**	APPLE CAT II	**$339**
D.C. HAYES	SMART/STACK MODEM			**$235**
	MICRO-MODEM II			**$295**
CCI Telnet Communications Package				**$135**

APPLE ACCESSORIES AND SOFTWARE

Mfr. by:Microsoft - Mountain Computers - Videx - CCS - Personal Software

VISICALC	**$159.00**	**VISIDEX**	**$159.00**
VISITERM	**$119.00**	**VISIPLOT**	**$139.00**
Z-80 SOFTCARD	**$259.00**	**VIDEX BOARD**	**$249.00**
KEYBOARD ENHANCER	**$110.00**	**16K CARD**	**$159.00**
APPLE JOYSTICK	**$ 49.00**	**SUP-R FAN**	**$ 39.00**
SUP-R MOD	**$ 25.00**	**CCS CARDS**	**$ CALL**
APPLE CARDS	**$ CALL**	**ASCII EXPRESS**	**$ 59.00**
SUPERCALC	**$199.00**	**ALF9 VOICE BOARD**	**$149.00**
CPS MULTIFUNCTION CARD			**$199.00**

ENTERTAINMENT

Mfr. by:On Line - Broderbund - Sirius - California Pacific

FLIGHT SIMULATOR	**$29.00**	**SARGON II**	**$29.00**
WIZARD & PRINCESS	**$28.00**	**ABM**	**$21.95**
MYSTERY HOUSE	**$24.00**	**GORGON**	**$34.95**
HI-RES FOOTBALL	**$35.00**	**MICROPAINTER**	**$29.00**
RASTER BLASTER	**$25.95**	**APPLE PANIC**	**$27.95**
SPACE EGGS	**$17.95**	**MATTEL GAMES**	**$27.00**

For fast delivery, send certified checks, money orders or call to arrange direct bank wire transfers. Personal or company checks require two to three weeks to clear. All prices are **mail order only** and are subject to change without notice. **Call for shipping charges.**

DEALER (NATIONAL/INTERNATIONAL) INQUIRIES INVITED **Send for FREE Catalogue**

The CPU SHOP

TO ORDER CALL TOLL FREE 1-800-343-6522

TWX: 710-348-1796 Massachusetts Residents call 617/242-3361

5 Dexter Row, Dept. C12M
Charlestown, Massachusetts 02129
Hours 10AM-6PM (EST) Mon.-Fri. (Sat. till 5)

Technical Information call 617/242-3361
Massachusetts Residents add 5% Sales Tax
Tandy Corporation Trademark/®Digital Research

master charge

VISA

CIRCLE 171 ON READER SERVICE CARD

The University of Wisconsin - Parkside

Second Annual International Computer Problem Solving Contest

April 17, 1982

RULES

Divisions:

Senior	SR:	Grades	10-12	(age ≤ 18)
Junior	JR:	Grades	7-9	(age ≤ 15)
Elementary	EL:	Grades	4-6	(age ≤ 12)

All students should be classified by grade or grade equivalent. The ages are listed to help assist schools outside North America establish equivalents.

Team Size: A team consists of one, two, or three students.

Computer System: Any computer system or computer language may be used; however, each team may use only one input device (keyboard/terminal). A printer must be available for listing the programs and the sample runs.

Time Limits: Each team has exactly two hours to write five programs and save them to disk or tape. After the two hour period, each team is allowed time to list their programs ,and sample runs to the printer. No changes in any program are allowed at this time except those changes in the PRINT or INPUT statements that may be necessary to get a hard copy. 15 minutes should be plenty of time for this job.

Grading Procedure: It is the responsibility of each local director to arrange for grading of the local contest. Sample solutions will be provided. Each program may be awarded 20 points. These points are broken down as follows:

1) 15 points for each program that runs correctly. No partial credit is possible here.

2) If it runs correctly, then 1 to 5 additional points may be given for design and ease of reading. No points are given if the program does not run correctly.

General: No outside help is allowed during the contest, including books, programs, or students not on the team. However, questions concerning the operation of the computer system or terminals, may be answered by the those conducting the contest. Any language reference book or pocket guide of commands and statements is also allowed. Time may be taken before the contest to familiarize the contestants with the computer system. Standard programming languages inherent to the processor of the computer should be used.

University of Wisconsin - Parkside

Second Annual International Computer Problem Solving Contest

April 17, 1982

REGISTRATION FORM

Instructions: Please fill out the enclosed form and mail it along with ; 1) a large 9x12 envelope addressed to the Contest Duplicator. Please affix four 18-cent stamps if you are mailing from within the United States; 2) a postcard addressed to the Contest Director if you wish to have your registration confirmed.

1. School or Organization ________________________________

2. Address ________________________________

3. City,State,Zip (USA) ________________________________

4. City,Country (non-USA) ________________________________

5. Contest Director ______________________ Ph ________

6. Contest Duplicator ______________________ Ph ________

7. Contest Problems requested for EL) JR) SR) divisions.

8. We expect to give the contest to approximately ____ EL, ____JR, and ___ SR teams.

As contest duplicator, I agree to keep the contest problems and the sample solutions sent to me. confidential until April 17 when I will turn them over to the contest director. I am not involved in any way in the preparation of student teams for the contest.

____

Contest Duplicator's signature

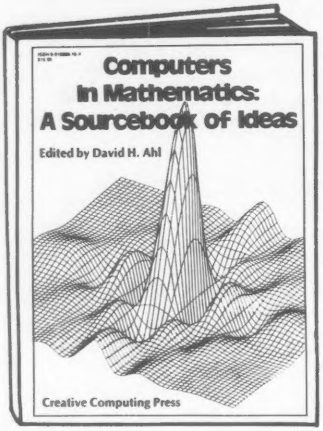
As contest director, I have read the rules of the contest and agree to follow them. I realize that I am responsible for conducting the local contest, having the results graded or ranked, and returning a completed Results Sheet supplied with the problems.

____

Contest Director's signature

Sourcebook of Ideas

Many mathematics ideas can be better illustrated with a computer than with a text book.



Computers in Mathematics: A Sourcebook of Ideas

Edited by David H. Ahl

Creative Computing Press

Consider Baseball cards. If there are 50 cards in a set, how many packs of bubble gum must be purchased to obtain a complete set of players? Many students will guess over 1 million packs yet on average it's only 329.

The formula to solve this problem is not easy. The computer simulation is. Yet you as a teacher probably don't have time to devise programs to illustrate concepts like this.

Between grades 1 and 12 there are 142 mathematical concepts in which the computer can play an important role. Things like arithmetic practice, X-Y coordinates, proving geometic theorems, probability, compounding and computation of pi by inscribed polygons.

Endorsed by NCTM

The National Council of Teachers of Mathematics has strongly endorsed the use of computers in the classroom. Unfortunately most textbooks have not yet responded to this endorsement and do not include programs or computer teaching techniques. You probably don't have the time to develop all these ideas either. What to do?

For the past six years, *Creative Computing* magazine has been running two or three articles per issue written by math teachers. These are classroom proven, tested ideas complete with flowcharts, programs and sample runs.

Teachers have been ordering back issues with those applications for years. However, many of these issues are now sold out or in very short supply.

So we took the most popular 134 articles and applications and reprinted them in a giant 224-page book called *Computers in Mathematics: A Sourcebook of Ideas.*

Ready-to-use-material

This book contains pragmatic, ready to use, classroom tested ideas on everything from simply binary counting to advanced techniques like multiple regression analysis and differential equations.

The book includes many activities that don't require a computer. And if you're considering expanding your computer facilities, you'll find a section on how to select a computer complete with an invaluable microcomputer comparison chart.

Another section presents over 250 problems, puzzles, and programming ideas, more than are found in most "problem collection" books.

Computers in Mathematics: A Sourcebook of Ideas is edited by David Ahl, one of the pioneers in computer education and the founder of *Creative Computing.*

The book is not cheap. It costs $15.95. However if you were to order just half of the back issues from which articles were drawn, they would cost you over $30.

Satisfaction Guaranteed

If you are teaching mathematics in any grade between 1 and 12, we're convinced you'll find this book of tremendous value. If, after receiving it and using it for 30 days you do not agree, you may return it for a full refund plus your return postage.

To order, send your check for $15.95 plus $1.00 postage and handling to Creative Computing Press, Morris Plains, NJ 07950. Visa, MasterCard, and American Express orders may be called in toll-free to 800-631-8112 (in NJ 201-540-0445). School purchase orders should add an additional $1.00 billing fee for a total of $17.95.

Don't put it off. Order this valuable sourcebook today.

creative computing

Morris Plains, NJ 07950
Toll-free **800-631-8112**
(In NJ 201-540-0445)
CIRCLE 300 ON READER SERVICE CARD

Problem

The world is full of intriguing problems that never got into a textbook.

Problems for Computer Solution
by Stephen Rogowski.

Ninety intriguing and fascinating problems, each thoroughly discussed and referenced, make an excellent source of exercises in research and preliminary investigation. Eleven types of problems are provided in the following areas: arithmetic, algebra, geometry, trigonometry, number theory, probability, statistics, calculus and science. Author Stephen Rogowski of SUNY-Albany has included several problems which have never been solved. He feels that some research and an attempt to solve these will sharpen students' insight and awareness.

Some of the problems are not new like the one asking how much the $24 the Indians were paid for Manhattan would be worth today had it been deposited in a bank. However, this problem was revised to have a variable interest rate so it would be a challenge to program. Of course, many of the problems are new and have never been in print before.

The student edition has 106 pages and includes all 90 problems (with variations), 7 appendices and a complete bibliography. Cost is $4.95.

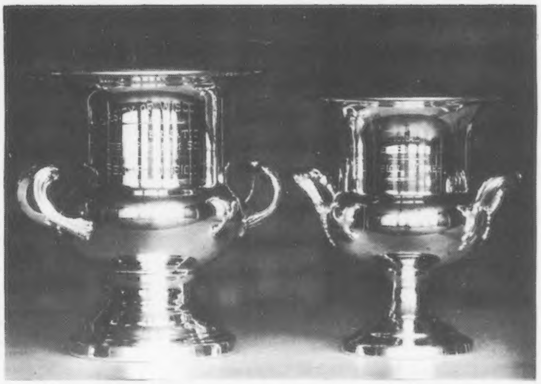
The 182-page teacher edition contains solutions to the problems, each with a complete listing in Basic, sample runs, and in-depth analyses explaining the algorithms and theory involved. Cost is $9.95.

To get one or both books send payment. plus $2.00 shipping and handling per order to *Creative Computing.* Credit card orders may be called in toll-free to the number below.

Order yours today. If you are not completely satisfied, return it for a full refund plus your return postage.

creative computing

Morris Plains, NJ 07950
Toll-free **800-631-8112**
(In NJ 201-540-0445)
CIRCLE 300 ON READER SERVICE CARD



The traveling trophies awarded to the winning Junior and Senior Division teams. The school and team member names are engraved on each trophy.

My Mailbox

One of the truly pleasant experiences associated with conducting the International Programming Contest last year was reading the letters that I received from several of the high ranking teams. Any thoughts that I may have subconsciously harbored that tended to classify exceptional computer programmers as keyboard junkies with tunnel vision were completely dispelled. Here are two letters that I received that told me much about the kinds of young students around the world who are being challenged by computers.

Dear Mr. Piele,

Thank you for your letter of congratulations regarding my ranking of "third" in the Junior Division of the First International Computer Problem Solving Contest.

This spring I also received a gold medal at the Long Island Math Fair (level 14) and placed first in the Junior Computer Division of the Long Island Science Congress.

Although I am only a 10th grader in high school, I have spent hundreds of hours at my computer mastering computer programming. Only through working at odd jobs have I been able to buy my present system which consists of a 16K Commodore computer, a tractor feed printer, sound box and cassette deck.

Through experimentation, I was able to use my computer to control a robot I constructed by myself. In the future I plan to program EPROM chips and sell computer software.

In school, I conducted informal classes in computer programming for the faculty as well as the students.

My biggest problem with my computer research is financing my experimentation. I would like to know where to write for funds or some type of grant to help me continue my research into the field of computers.

Thank you for your time and trouble.

Craig Cohen
78 Frankel Blvd.
Merrick, Long Island 11566

Dear Dr. Piele,

I am writing to you on behalf of Karen Eller, Peter Fraser and myself acknowledging the congratulations you sent to us on achieving second placing in the senior division of the First International Computer Problem Solving Contest sponsored by your University.

All three of us were thrilled with the news.

Early last month after receiving the news of our success, our school organized a special assembly at which two representatives of Hewlett Packard presented each of us with an HP 41C programmable calculator. In addition, the nine students from our other three teams which participated in the contest, received an encouragement award in the form of a book presented by the Regional Director of Education. The assembly was televised by our local TV station and excerpts were shown on the evening news.

At present we are all very busy preparing our entries for a State Science Talent Search. Greg Parrent, Nigel Edwards and myself have entered a computer-driven solar tracker. Mark McConnel has done a project on "Velocity Tolerance of a Bar-Code Scanner," and Debbie Eller is working on a Computer Simulation of Mendel's Experiments.

With the end of our academic year drawing ever-closer, Karen Eller and Peter Fraser, who are two academic years ahead of me, are very busy preparing for their final examinations.

Thank you once again for your congratulations, and in particular thank you for the opportunity given to us to participate in the contest.

Bruce M. Edwards
Terang High School
P.O. Box 124
Terang, Victoria 3264
Australia

Solutions To Last Month's Problems

Six problems were presented last month that dealt with the generation and study of prime and related numbers. The problems were called; Prime Factorization, Prime Numbers, The Sieve of Eratosthenes, Random Primes, and Lucky Numbers. Following is a set of solutions. (Page 61)

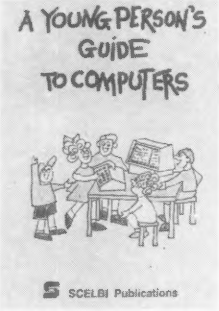
Program Remarks

Last month, I invited interested readers to find their fastest Basic algorithm for generating the prime numbers between 2 and 1000. The Super Fast Sieve of Eratosthenes listed below is our best effort. The time that it takes this program to generate the 168 prime numbers between 2 and 1000 and print them out on the screen was recorded for a variety of microcomputers.

Microcomputer	Time (Seconds)
TRS-80 Level II	11
Atari	10
TRS-80 Color Computer	10
PET/CBM	9
Apple II (Applesoft)	8
North Star Horizon	5
Microsoft Basic on N.S.	5

Can anyone do better? If so, send it along. I would like to share the news with others in a future article.

Two other programs—Lucky Numbers and Random Primes—could stand a great deal of improvement. As written, they are very slow. There must be faster implementations of the sieve algorithm for generating Lucky and Random Prime Numbers. ☐



A BOOK FOR KIDS? Yes! For youngsters, eager to get their first glimpse at the world of computing. Includes a brief history of the computer. Discusses the manner in which a computer must be told how to do anything. This book is a real charmer. Lavishly illustrated tor youngsters. The book for your children is here! Order now.

Order publication number I.S.B.N. 0-939280-00-0
Price in United States: just $7.95 + $1.00 s/h by mail.

Please include remittance with order. Allow 3 - 4 weeks for delivery. MasterCard & VISA credit cards accepted. Our phone line for credit card orders is (203) 888-1946. Foreign price list available. Write for more information.

☐ Check here for descriptive literature & catalog.

Name: ______________________________
Addr: ______________________________
City: ________________ State: ___ Zip: _____
MC/VISA # __________________ Bank: _____
Signature: ___________________________

SCELBI Publications

35 Old State Road, Oxford, CT 06483

CIRCLE 156 ON READER SERVICE CARD

ANNOUNCING!

Micro Courseware You Can Bank On

Now available from MCE new, exciting Money Management Series including: **You Can Bank On It, Income Meets Expenses, Money Management Assessment.**

These new programs are designed to practically and conceptually provide the basic living skills of successful money management while expanding the learner's mathematic ability. Developed for use with a variety of age groups and special needs curriculum areas, MCE programs are effective teaching aids for improving the quality and productivity of education.

For a free catalog, full information about these and other MCE programs and the name of your nearest MCE dealer, write or call collect **(616) 345-8681.**

Programs available for Apple II.®

INTERPRETIVE EDUCATION, INC.®
Dept. 16F
157 S. Kalamazoo Mall
Kalamazoo, MI 49007

T.M
mce
MICROCOMPUTER EDUCATIONAL PROGRAMS

CIRCLE 151 ON READER SERVICE CARD

NEW Apple® Utility Disks!

With Free PEEKS & POKES Wall Chart!

Beagle Bros ™
MICRO SOFTWARE

4315 Sierra Vista
San Diego,
CA 92103
714-296-6400

WITH EACH ORDER, YOU WILL RECEIVE . . .

- ☐ **Dos Boss, Utility City** or **Alpha Plot** on Applesoft Disk
- ☐ A 40-page **Apple Tip Book** (each entirely different)
- ☐ An 11x17 Apple **PEEKS, POKES & POINTERS** Chart

PEEKS, POKES & POINTERS
(not available separately)

BONUS WITH EACH DISK!

POKE your Apple all night long with this handy 11 x 17 reference poster! The most useable PEEKS, POKES, POINTERS & CALLS scrounged up from every source imaginable! A great companion to our original Apple Command Chart.

utility city

21 of our most-asked-for Apple Utilities

by Bert Kersey 48K Applesoft ROM

For YOUR Big Apple—Our 21 most-asked-for Apple Utilities on one big disk—**List Formatter** makes properly spaced & indented listings with printer page breaks. Each program statement is on a new line with If-Then's & Loops called out; a great de-bugger! **Catalog in any number of columns** & any page-width to CRT or printer. Automatically post the Run-Number & last-used Date in your programs. **Make any command invisible** in your listings; Access program lines in memory for garbage repair & "illegal" alteration; Quickly sort & store info on disk; Run any Applesoft file while another stays intact; Move lines within your programs; Renumber to 65535; Save inverse, INVISIBLE & trick file names; Convert dec to hex & binary, or INT to FP; Append programs; dump the text screen to ANY printer . . . More too: **21 Programs Total!**

PLUS . . . APPLE TIP BOOK NUMBER THREE!
40 PAGES of new tips, tricks & articles—"DOS Trickery," "Copy Stoppers," "Programming the Reset Key" & much more. Plus understandable explanations of how each U-City Program works—One of the best Apple learning tools on the market today!

ALL 21 PROGRAMS
$29.50
+$1.50 Shipping

- ✓ **Utility City** on Applesoft Disk
- ✓ 40-page Beagle Bros Apple Tip Book # 3
- ✓ Apple PEEKS, POKES & POINTERS Chart

alpha plot

Hi-Res Apple Graphics/Text Utility

by Bert Kersey & Jack Cassidy 48K REQUIRED

HI-RES DRAWING: Create hi-res pictures & charts, **appendable to your programs.** Keyboard or Paddle control; Optional Xdraw Cursor (see lines before you draw!); Any color mix or REVERSE (opposite of background); Circles, Boxes & Ellipses, filled or not. Bonus Programs too—**SCRUNCHER** stores hi-res in as little as 1/3 normal disk space. **SHIFTER** transfers any portion of the hi-res screen. Also superimpose hi-res images and convert Hi-Res to Lo-Res & back for fascinating abstracts!

HI-RES TEXT: Beautiful upper & lower case with Descenders; color or reverse; Positionable anywhere (NOT restricted by Htabs & Vtabs). Professional looking **PROPORTIONAL SPACING!** Adjustable Type Size, Leading (line spacing) & Kerning (letter spacing). Multi-directional typing; up, down, even backwards!

PLUS . . . APPLE TIP BOOK NUMBER FOUR!
40 PAGES of tips for making the most of your Apple's advanced graphics capabilities. Alpha instructions plus shape table tips, new titling & color tricks and fascinating animation experiments!

$39.50
+$1.50 Shipping

- ✓ **Alpha Plot** on Applesoft Disk.
- ✓ 40-page Beagle Bros Apple Tip Book # 4
- ✓ Apple PEEKS, POKES & POINTERS Chart.

dos boss

DISK COMMAND EDITOR

by Bert Kersey & Jack Cassidy

A classic utility you will ENJOY! **Rename Commands:** "Catalog" can be "Cat," etc. **Save-Protect your programs;** Unauthorized copy attempts produce "Not Copyable" message. 1-Key Program Selection from catalog (extremely handy!). Catalog Customizer—Change Disk Volume message to your title; Omit or alter file codes; Catalog by file type, etc. Rewrite Error Messages—"Syntax Error" can be "Oops!" or anything you want!

All of Dos Boss's change feaures may be appended to your programs, so that anyone using your disks on any Apple (booted or not) will be formatting DOS the way you designed it!

PLUS . . . APPLE TIP BOOK NUMBER TWO!
With valuable DOS information: "Poking Around in DOS," "Making Programs Unlistable," "Two-Sided Disk Tips," "Care of Your Drives," "Creative Peeking & Poking," "3.2 vs 3.3," etc.

ONLY
$24.
+$1.50 Shipping

- ✓ **Dos Boss** on Applesoft Disk
- ✓ 40-page Beagle Bros Apple Tip Book # 2
- ✓ Apple PEEKS, POKES & POINTERS Chart

MINIMUM 32K REQUIRED

AT YOUR APPLE DEALER NOW. OR ORDER BY PHONE AT ANY HOUR... TOLL FREE!

Ask around about Beagle Bros Software.
Our programs are practical, friendly & user-oriented, and always come with an amazing amount of documentation & juicy Apple information. If your dealer doesn't have our stuff, get on his case about it, or order directly from us. We ship all disks & books WITHIN 48 HOURS.

24 hour TOLL FREE Order Desk:
MasterCard, VISA or COD orders, call:

Nationwide:	**800-854-2003**	ext. 827
California:	**800-522-1500**	ext. 827
Alaska/Hawaii:	**800-854-2622**	ext. 827

(Orders only please. Questions, phone 714-296-6400. COD orders, add $3.)

Or order by mail (use this coupon or separate sheet)

(Use this coupon or separate sheet)

RUSH! The disks checked below
Plus The Tip Book and PEEKS & POKES Chart!

☐ **UTILITY CITY** ($31) ☐ **ALPHA PLOT** ($41) ☐ **DOS BOSS** ($25.50)

(Prices include First Class Shipping; Calif. residents add 6%.)

NAME$= ______________________ Specify: ☐ **3.2** ☐ **3.3**
ADDR$= ______________________
CITY$= ________________ **ZIP=** ________

VISA

VISA/MASTERCARD: Include Account No. & Expiration Date.

master charge
THE INTERBANK CARD

Mail U.S. check, money order or Visa/MC Numbers
to: **BEAGLE BROS, Dept. C**
4315 Sierra Vista,
San Diego, CA 92103
Telephone (714) 296-6400.

Please add $4.50 for shipping outside US or Canada.
COD orders, add $3. California residents, add 6%.

CIRCLE 160 ON READER SERVICE CARD

How to Solve it, continued...

Problem Solutions

```
10 PRINT "PRIME FACTORIZATION"
20 PRINT
30 PRINT "This program takes an integer N and factors it"
40 PRINT "into its prime factors."
50 PRINT
60       INPUT "Enter an integer ";N
70       PRINT N;"=";
80 :
90       F=1
100      F=F+1
110      IF F>3 THEN F=F+1
120      IF N/F<>INT(N/F) THEN 100
130 :
140      PRINT F;
150      N=N/F
160      IF N=1 THEN END
170      PRINT "x";
180 GOTO 90
```

```
PRIME FACTORIZATION

This program takes an integer N and factors it
into its prime factors.

Enter an integer  234
 234 = 2 x 3 x 3 x 13

Enter an integer  30030
 30030 = 2 x 3 x 5 x 7 x 11 x 13
```

```
10 PRINT "PRIME NUMBERS - TRADITIONAL "
20 PRINT
30 PRINT "This program generates the prime numbers from "
40 PRINT "2 to 1000 by checking each number for divisors using"
50 PRINT "odd numbers."
60 PRINT
70       PRINT 2,3,
80       FOR P=3 TO 1000 STEP 2           'P=POSSIBLE PRIME
90           FOR I=3 TO SQR(P) STEP 2     'TEST FOR ODD DIVISORS
100              X=P/I                    'UP TO SQUARE ROOT OF P.
110              IF X=INT(X) THEN 140
120          NEXT I
130        PRINT P,
140      NEXT P
150 END
```

```
10 PRINT "PRIME NUMBERS - MODIFIED TRADITIONAL"
20 PRINT "This program generates the prime numbers from"
30 PRINT "2 to 1000 by checking each number for divisors"
40 PRINT "using the previous primes."
50 PRINT
60       DIM A(200)
70       PRINT 2,3,
80       M=2: A(2)=3
90       FOR P=3 TO 1000 STEP 2               'P=possible prime.
100          FOR I=2 TO M*(M<12)+12*(12<=M)    'Test for prime
110              X=P/A(I)
120              IF X=INT(X) THEN 170         'of 31 and last prime.
130          NEXT I
140        PRINT P,
150        M=M+1
160        A(M)=P
170      NEXT P
180 END
```

```
PRIME NUMBERS - MODIFIED TRADITIONAL
This program generates the prime numbers from
2 to 1000 by checking each number for divisors
using the previous primes.

      2     3     5     7    11    13    17    19    23    29    31    37
     41    43    47    53    59    61    67    71    73    79    83    89
     97   101   103   107   109   113   127   131   137   139   149   151
    157   163   167   173   179   181   191   193   197   199   211   223
    227   229   233   239   241   251   257   263   269   271   277   281
    283   293   307   311   313   317   331   337   347   349   353   359
    367   373   379   383   389   397   401   409   419   421   431   433
    439   443   449   457   461   463   467   479   487   491   499   503
    509   521   523   541   547   557   563   569   571   577   587   593
    599   601   607   613   617   619   631   641   643   647   653   659
    661   673   677   683   691   701   709   719   727   733   739   743
    751   757   761   769   773   787   797   809   811   821   823   827
    829   839   853   857   859   863   877   881   883   887   907   911
    919   929   937   941   947   953   967   971   977   983   991   997
```

MOUNTAIN

SOFTWARE

FREE OFFER

WITH PURCHASE OF ANY 3 PROGRAMS, YOU WILL RECEIVE FREE THE ORIGINAL ADVENTURE GAME, CONVERTED TO LOAD ENTIRELY INTO 48K RAM ON APPLE. NOTHING LEFT OUT. AMAZING!

apple®

SOFTWARE

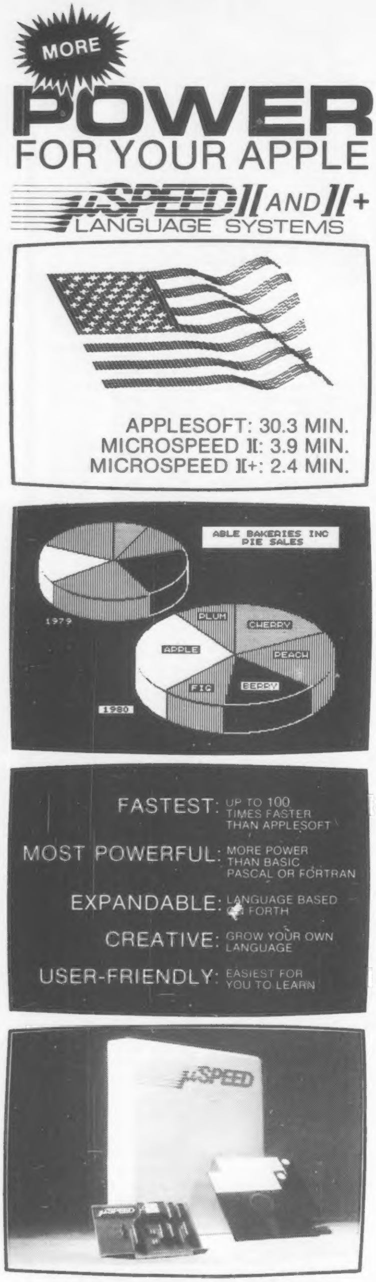
☐ Adventures #1, 2, 3	$39.95	NOW	$32.50
☐ Adventures #4, 5, 6	$39.95	NOW	$32.50
☐ Adventures #7, 8, 9	$39.95	NOW	$32.50
☐ Adventures #10, 11, 12	$39.95	NOW	$32.50
☐ Project Omega	$24.95	NOW	$19.50
☐ Pro Picks	$24.95	NOW	$19.50
☐ 16K Expansion Card	$195.00	NOW	$149.50
☐ Hodge Podge (age 2/5)	$23.95	NOW	$21.50
☐ Teacher's Pet	$15.95	NOW	$14.50
☐ Temple of Apshai	$39.95	NOW	$32.50
☐ Hellfire Warrior	$39.95	NOW	$32.50
☐ Crush, Crumble and Chomp	$29.95	NOW	$24.50
☐ Book of Apple Software	$19.95	NOW	$15.50
☐ Apple Panic	$29.95	NOW	$24.50
☐ Raster Blaster	$29.95	NOW	$26.50
☐ Alien Rain (Galaxian)	$24.95	NOW	$22.50
☐ Alien Typhoon	$24.95	NOW	$22.50
☐ Snoggle (Puckman)	$24.95	NOW	$22.50
☐ Space Warrior	$24.95	NOW	$20.50
☐ HEAD ON	$24.95	NOW	$22.50
☐ Fantasyland 2041	$59.95	NOW	$52.50
☐ Bridge 2.0	$21.95	NOW	$19.50
☐ Ultima	$39.95	NOW	$34.50
☐ Home Money Minder	$34.95	NOW	$29.50
☐ Compu-Math Arithmetic	$49.95	NOW	$39.50
☐ Compu-Math Fractions	$39.95	NOW	$33.50
☐ Compu-Math Decimals	$39.95	NOW	$33.50
☐ Algebra 1	$39.95	NOW	$33.50
☐ Spelling Bee	$29.95	NOW	$25.50
☐ The Prisoner	$29.95	NOW	$25.50
☐ Sargon II (chess)	$34.95	NOW	$29.50
☐ Pool 1.5	$34.95	NOW	$29.50
☐ Spellguard for Apple	$295.00	NOW	$245.50
☐ Sup'R' Terminal 80 Col.	$375.00	NOW	$309.50
☐ Memorex 3401 Box of 10	$45.00	NOW	$24.50
☐ Word Star	$375.00	NOW	$275.50
☐ Z-80 Softcard With CP/M	$399.00	NOW	$299.50
☐ Robot Wars	$39.95	NOW	$34.50
☐ 12" Hi-Res Green Mon	$285.00	NOW	$236.00
☐ A.B.M.	$24.95	NOW	$22.50
☐ Castle Wolfenstein	$29.95	NOW	$25.50
☐ Mission Asteroids	$19.95	NOW	$17.50
☐ Mystery House	$24.49	NOW	$21.50
☐ Wizard and the Princess	$32.95	NOW	$29.50
☐ Cranston Manor	$34.95	NOW	$29.50
☐ Pegasus II	$29.95	NOW	$25.50
☐ Hi-Res Football	$39.95	NOW	$34.50
☐ Hi-Res Soccer	$29.95	NOW	$25.50
☐ Soft Porn Adventure	$29.95	NOW	$25.50
☐ Gobblers	$24.95	NOW	$19.50
☐ Zork	$39.95	NOW	$33.50
☐ Visicalc 3.3	$199.95	NOW	$169.50
☐ Magic Wand 80 Column	$395.00	NOW	$289.50
☐ Falcons	$29.95	NOW	$25.50
☐ Fastgammon	$24.95	NOW	$20.50
☐ International Grand Prix	$29.95	NOW	$25.50
☐ Space Eggs	$29.95	NOW	$24.50
☐ Orbitron	$29.95	NOW	$24.50
☐ Gamma Goblins	$29.95	NOW	$24.50
☐ Epoch	$34.95	NOW	$28.50
☐ Pulsar II	$29.95	NOW	$24.50
☐ Autobahn	$29.95	NOW	$24.50
☐ Sneakers	$29.95	NOW	$24.50
☐ Galactic Attack	$29.95	NOW	$25.50
☐ Magic Window Word Proc.	$99.95	NOW	$84.50
☐ IFO Database Manager	$120.00	NOW	$99.50
☐ D-B Master	$229.00	NOW	$189.50
☐ The Warp Factor	$39.95	NOW	$33.50
☐ Flight Simulator	$33.50	NOW	$29.50
☐ Pro Football Pt. Pred.	$26.95	NOW	$22.50
☐ Win AT The Races	$39.95	NOW	$34.50
☐ Videoterm 80 Col Card	$345.00	NOW	$279.50
☐ Multiple Regression	$29.95	NOW	$25.50

★ SEND FOR FREE PRICE LIST & CATALOG ★

DEDUCT 3% IF PAYMENT ACCOMPANIES ORDER. WE PAY SHIPPING AND IF YOU PHONE YOUR ORDER WE WILL CREDIT **$1.00 FOR CALL.** CALIFORNIA RESIDENTS ADD 6% SALES TAX. ALL ORDERS SHIPPED FROM STOCK WITHIN 48 HOURS. WE ACCEPT **MASTER CARD AND VISA.** C.O.D.'s ADD $5.00.

★ 518 E. ECHO CT.,
SAN BERNARDINO, CA 92404
PHONE ORDERS (714) 886-0761

CIRCLE 308 ON READER SERVICE CARD


MORE
POWER
FOR YOUR APPLE
µSPEED][AND][+
LANGUAGE SYSTEMS
APPLESOFT: 30.3 MIN.
MICROSPEED][: 3.9 MIN.
MICROSPEED][+: 2.4 MIN.
ABLE BAKERIES INC
PIE SALES
1979
1980
PLUM
CHERRY
APPLE
PEACH
FIG
BERRY
FASTEST: UP TO 100 TIMES FASTER THAN APPLESOFT
MOST POWERFUL: MORE POWER THAN BASIC PASCAL OR FORTRAN
EXPANDABLE: LANGUAGE BASED ON FORTH
CREATIVE: GROW YOUR OWN LANGUAGE
USER-FRIENDLY: EASIEST FOR YOU TO LEARN
µSPEED

REQUIRES APPLE , SINGLE DISK
U SPEED][USES 2mHz PROCESSOR
µ SPEED][+ USES 4mHz PROCESSOR

SEE YOUR DEALER OR CONTACT:

applied analytics incorporated
8910 Brookridge Dr., Suite 505, Upper Marlboro, Md. 20870
(301) 627-6650
I'm Interested: Please Send
☐ µ SPEED][$495. ☐ 160 page Manual $35.
☐ µ SPEED][+ $645. ☐ Detailed Information
Name ____________
Address ____________
City ____________
State ________ Zip ________

CIRCLE 121 ON READER SERVICE CARD

Survival, continued...

```
10 PRINT "SIEVE OF ERATOSTHENES - STANDARD"
20 PRINT
30 PRINT "This program generates the prime numbers between"
40 PRINT "2 and 1000 by using the Sieve of Eratosthenes."
50 PRINT
60      DIM X(1000)
70      FOR I=1 TO 1000                 ´Initialize an array
80           X(I)=I                     ´with the numbers from
90      NEXT I                          ´1 to 1000.
100 :
110     P=2
120     PRINT P,
130       IF P*P>1000 THEN 180         ´Sieve is complete.
140         FOR I=P*P TO 1000 STEP P   ´Delete the multiples
150           X(I)=0                   ´of P.
160         NEXT I
170 :
180     FOR J=P+1 TO 1000              ´Print out primes.
190        IF X(J)<>0 THEN P=J : GOTO 120
200     NEXT J
210 END
```

```
10 PRINT "SIEVE OF ERATOSTHENES - SUPER FAST"
20 PRINT
30 PRINT "The program generates the prime numbers between"
40 PRINT "2 and 1000 using a super fast Sieve Method."
50 PRINT
60      DIM N%(1000)              ´No initialization needed.
70      PRINT 2,
80        FOR P=3 TO 997 STEP 2
90          IF N%(P) THEN 150
100         IF P>31 THEN 140
110           FOR D=P*P TO 997 STEP 2*P
120             N%(D)=1            ´Delete multiples of P.
130           NEXT D
140         PRINT P,
150       NEXT P
160 END
```

```
10 PRINT "RANDOM PRIMES"
20 PRINT
30 PRINT "This program generates a set of Random Prime numbers"
40 PRINT "between 1 and 1000."
50 PRINT
60      DIM X(1000)
70      R=2
80      PRINT R,
90          FOR I=1 TO 1000
100          IF X(I)=1 THEN 130            ´Skip the ones deleted.
110          X=INT(RND(1)*R)               ´Pick a random number.
120          IF X=0 THEN X(I)=1            ´Delete 1 out of R
130       NEXT I                           ´on the average.
140 :
150       FOR J=R+1 TO 1000                ´Search for next
160          IF X(J)=0 THEN R=J : GOTO 80  ´Random Prime.
170       NEXT J
180 END
```

```
RANDOM PRIMES

This program generates a set of Random Prime numbers
between 1 and 1000.

        2    3    10   13   15   21   23   25   27   30   31   35
        51   53   62   67   71   81   84   87   88   102  103  113
        121  133  139  146  149  150  155  157  165  170  177  185
        190  192  199  202  213  223  224  227  238  240  253  267
        278  283  292  304  307  312  327  341  352  355  361  364
        381  385  391  392  393  401  422  425  430  437  439  448
        450  456  462  463  464  465  469  470  475  476  487  516
        521  528  536  563  576  579  583  598  599  601  602  608
        611  633  634  635  645  646  657  660  671  679  682  692
        714  719  725  726  728  729  734  739  742  745  747  753
        760  766  781  789  791  808  811  814  816  832  843  851
        859  864  873  874  881  891  899  901  903  905  910  922
        928  932  940  947  958  979  982  983  985  991  997
```

```
10 PRINT "LUCKY NUMBERS "
20 PRINT
30 PRINT "This program generates the Lucky Numbers between"
40 PRINT "1 and 1000."
45 PRINT
50      DIM X(1000)
60      PRINT 1,
70      L=3
80      PRINT L,
90        C=0
100       FOR I=1 TO 1000 STEP 2
110          IF X(I)=0 THEN C=C+1            'Count the terms and
120          IF C/L=INT(C/L) THEN X(I)=1       'delete every Lth one.
130       NEXT I
140 :
150       FOR J=L+2 TO 1000 STEP 2           'Search for next
160          IF X(J)=0 THEN L=J : GOTO 80     'Lucky Number.
170       NEXT J
180 END
```

```
LUCKY NUMBERS

This program generates the Lucky Numbers between
1 and 1000.

      1    3    7    9    13   15   21   25   31   33   37   43
      49   51   63   67   69   73   75   79   87   93   99   105
      111  115  127  129  133  135  141  151  159  163  169  171
      189  193  195  201  205  211  219  223  231  235  237  241
      259  261  267  273  283  285  289  297  303  307  319  321
      327  331  339  349  357  361  367  385  391  393  399  409
      415  421  427  429  433  451  463  475  477  483  487  489
      495  511  517  519  529  535  537  541  553  559  577  579
      583  591  601  613  615  619  621  631  639  643  645  651
      655  673  679  685  693  699  717  723  727  729  735  739
      741  745  769  777  781  787  801  805  819  823  831  841
      855  867  873  883  885  895  897  903  925  927  931  933
      937  957  961  975  979  981  991  993  997
```

And

Publish ~~Or~~ Perish?

An exaggeration of course! But your choice of a software publisher can make the difference between success or a mediocre future for your program.

SRA, a subsidiary of IBM, and a leading publisher of top quality educational software invites authors and creators of superior software to submit completed programs for evaluation and consideration for publication.

We are interested in programs for the IBM Personal Computer, the Apple II Personal Computer, and the TRS-80 Model III and Color Computer in these areas...

- Business and historical simulations
- Adult and children's education
- Games
- Personal enrichment

Only those submissions that meet our exacting standards for quality, originality, and playability will be published.

If the idea of adding your superior program to our top quality product line appeals to you and you'd like to discuss the possibilities, contact us for details:

SRA®

Science Research Associates, Inc.
Software Products Department
155 North Wacker Drive
Chicago, Illinois 60606

CIRCLE 334 ON READER SERVICE CARD

CONTINUOUS TAX FORMS

New 1981 Tax Forms
NOW AVAILABLE

IRS Approved Formats

- W-2 Forms - 4 pt - 6 pt - 8 pt
  -1 wide - 2 wide - Mailers
  - carbon interleaved or carbonless
- 1099's • 1087's • 1040's
- 941A • 941 - 940 • DE 3B
- Calif. Sate 540's and 540 ES

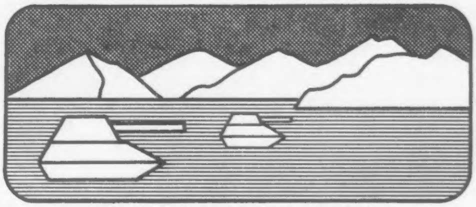
Call or write for Free Tax Forms Catalog
1981 Programming Guide included with Catalog

ALPHA COMPUTING SUPPLY, INC.
9625 Mason Avenue
Chatsworth, CA 91311
(213) 882-9818

CIRCLE 114 ON READER SERVICE CARD

AMBER SOFTWARE

Software for Apple and Apple II plus



Robot Tank Invasion by Jay Crafferty

Tired of dots, dashes and two dimensional animation? Attack and destroy enemy tanks that are programmed to destroy your tank. High resolution graphics and sound effects add to the excitement of this fast machine language program. Runs on any Apple with Applesoft, and at least 48K of RAM. Diskette $34.95.

AMBER SOFTWARE
Amber Software
170 Parsippany Rd., Parsippany NJ
(201) 887-6474

CIRCLE 113 ON READER SERVICE CARD

images...ibm images...ibm image

Will Fastie

In which Will reveals the mystical secrets of how, where, and why to buy your own...

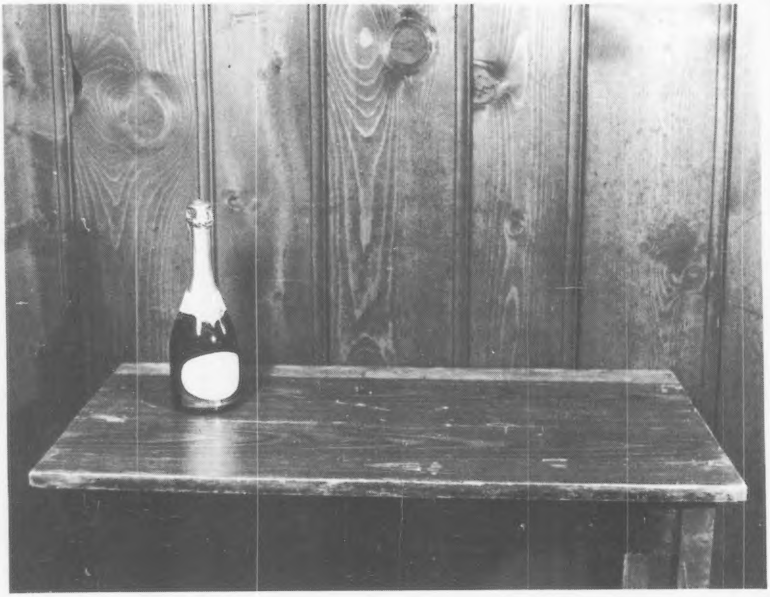
Welcome to my column. I'm glad to be here.

I'm going to do my best to make this interesting reading every month. I'll try hard to give you quality as well as quantity, and I'll try to keep the information content high. *Creative* and I will welcome your comments, criticisms, and ideas. I'll also be looking for your help, in the form of information. For obvious reasons, I would like to learn anything you know or learn about the IBM Personal Computer and associated matters. I'm going to be most interested in software. I'll be hungry for the earliest possible news about product developments—vendors take note!

About replies: this column is my forum, and I'll try to answer you here, sooner or later. If you really want a direct response from me, please send a stamped, self-addressed envelope along. I promise to do my best to reply, as my time permits. Writing this column only pays the computer bills—I have a real job too!

Since this is an inaugural column, it is only appropriate that we deal with an inaugural subject. I'll tell you where and how to buy the IBM Personal Computer, and why you should (or shouldn't). "Balderdash," you say? "Why aren't we hearing some heavy technical junk?" you ask. Well, my friends, take a close look at Photo 1. See the IBM Personal Computer sitting on the table next to my inaugural bottle of champagne? You don't? Well see, here's the thing. When I took the picture for this column there was no computer on that table. However, these is now, right this minute, even as you read. Isn't time travel wonderful?

W. H. Fastie, 7110 Sheffield Rd., Baltimore, MD 21212.



The Author's System.

Down to Business

The where and how of buying the Personal Computer are somewhat interrelated. "Where" is who sells them, and "how" is what kind of money they accept. We'll talk about "why" later.

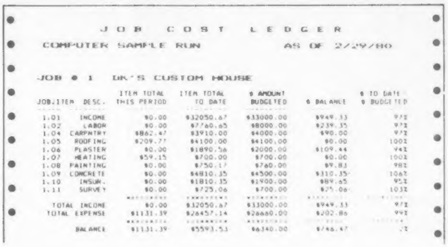
There are, at the moment, four ways you can buy the IBM Personal Computer. The first is through an IBM Product Center. The second is also from IBM, but through the Data Processing Division (DPD) if the quantity you require is sufficiently high. The third is in one of the new Sears Business Systems Centers. The last, but most likely for most of you, is in a Computerland store.

IBM Product Centers

The odds are this won't work for you. It does for me because I happen to live in Baltimore, the location of one of only three Product Centers. The other two are located in Philadelphia and San Francisco. These stores are simply manufacturer's retail outlets, selling only products made by IBM. The stores carry office equipment, like the Selectric typewriters, and small systems. The systems sold before the Personal Computer were the IBM 5120 and the DisplayWriter word processor. The "Datamaster" System 23 was introduced about the same time as the Personal Computer.

Introducing the total job costing program

Now you can effectively manage dozens of jobs *simultaneously* with accuracy and confidence. You'll be able to plan, track and report *every* cost on every job — from start to finish. Detailed in-progress job reports allow you to zero in on problems and eliminate them — *before they cut into profits.*



```
          J O B   C O S T   L E D G E R
   COMPUTER SAMPLE RUN              AS OF 2/29/80

   JOB # 1   DK'S CUSTOM HOUSE

                      ITEM TOTAL   ITEM TOTAL   $ AMOUNT                 $ TO DATE
   JOB.ITEM  DESC.   THIS PERIOD    TO DATE     BUDGETED    $ BALANCE   $ BUDGETED
   --------  -----   -----------  -----------  ----------   ---------   ----------
    1.01     INCOME        $0.00    $32050.67   $33000.00     $949.33          97%
    1.02      LABOR        $0.00     $7760.65    $8000.00     $239.35          97%
    1.04   CARPNTRY      $862.47     $3910.00    $4000.00      $90.00          97%
    1.05    ROOFING      $209.77     $4100.00    $4100.00       $0.00         100%
    1.06    PLASTER        $0.00     $1890.56    $2000.00     $109.44          94%
    1.07    HEATING       $59.15      $700.00     $700.00       $0.00         100%
    1.08   PAINTING        $0.00      $750.17     $760.00       $9.83          98%
    1.09   CONCRETE        $0.00     $4810.35    $4500.00    $310.35-         106%
    1.10     INSUR.        $0.00     $1810.35    $1900.00      $89.65          95%
    1.11     SURVEY        $0.00      $725.06     $700.00      $25.06-        103%
                     ***********  ***********  **********   *********   **********
       TOTAL INCOME        $0.00    $32050.67   $33000.00     $949.33          97%
      TOTAL EXPENSE     $1131.39    $26457.14   $26660.00     $202.86          99%
                     ***********  ***********  **********   *********   **********
            BALANCE     $1131.39-    $5593.53    $6340.00     $746.47           2%
```

Job Cost Ledger

- Automatically posts income and expense for each job.
- Gives listing for budgeted expense and income.
- Compares budget amount to actual expense.
- Provides percentage differential between budget amount and actual expense.
- Calls out problem areas with a special "arrowhead."

Financial Statements

To obtain a complete set of financial statements, the Contractor's Job Cost Program generates an in-depth, up-to-date report in less than an hour instead of days needed using a manual system. This saves time . . . and time is money for contractors.

- Automatic balance sheets.
- Automatic income statements.
- Automatic accounts receivable journal.
- Automatic accounts payable journal.
- Vendor *cheque writer* system
- For the Apple II+ with 48K memory.

KBS

Series I . . . **$1195^00**
Series II . . **$1795^00**

KLEINHAMMER **BUSINESS SOFTWARE**
P.O. Box 1065, Morro Bay, CA 93442 805/772-2766
Apple is a trademark of Apple Computer, Inc.

CIRCLE 291 ON READER SERVICE CARD

Buy with Confidence from the best

GREAT PRICES, GREAT SERVICE, GUARANTEED

COMPUTERS, PRINTERS, TERMINALS

Apple IEEE-488 card now available

CALL TOLL FREE: 1 800 421-1520
In Calif. 213 320-4772

COMPUTERS

apple computer

Apple Computers
Disk drives, accessories
software, graphics tablets.
CALL FOR BEST PRICES

HEWLETT PACKARD

Whether you want their great computer or a wide selection of computer calculators-we have them

HP-85 - Retail $3250
Only $2475

Call us for great prices:
Altos, Atari, NEC, Zenith and other computers

PRINTERS - MONITORS

NEW MX 100 & MX 80 F/T

The new 136 column Epson printer with graphics and the Friction/tractor MX 80 are in stock. WE HAVE THE GRAPHIC PACKAGE FOR MX 80. **call.**

SILENTYPE PRINTER ONLY $295.00

MONITORS
BMC & NEC Green Screen NOW IN STOCK

EDUCATORS

We have the CORVUS systems to hook up several Apple computers at once!

NEC & DIABLO PRINTERS
Anadex, Paper Tiger. CALL for latest prices

Computer furniture too

ACCESSORIES - SOFTWARE

Amazing Mountain Hardware
CPS Multi-function card
ALL IN ONE:
Parallel/Serial/Clock/Calen

SOFTWARE

Visicalc 3.3	$175/	Reg. $199
BPI GL/INV/AR/etc	299/	Reg. 399
Tax Preparer by Howardsoft...	125/	Reg. 150
Real Estate Analyzer,Howardsoft	125/	Reg. 150
Creative Financing, Howardsoft	125/	Reg. 150
ASCII Express II by SDS.......	55/	Reg. 65
Z-TERM (CPM) (16 sector)	85/	Reg. 100

TRS 80 & ATARI SOFTWARE TOO

PLOTTERS
Bausch&Lomb plotters for your computer by Houston Instruments... CALL!

MICROSOFT 16K
Ramcard $139

CALL TOLL FREE
1(800)421-1520
in Cal (213)3204772

Dysan CORPORATION
104/1
5¼" Disks only **3.95**

Visit our retail store:
Net Profit Computers
521 W. Chapman Ave
Anaheim, Cal. 92802
714 750-7318

Mail orders ONLY:
NET PROFIT COMPUTERS
2908 Oregon Court, Bld G1
Torrance, Ca 90503
1(800)421-1520
in Cal: 213 320-4772

VISA

Cal residents add 6% sales tax. Minimum shipping and handling charges are $3.00. Mstch, Visa, Amex prices slightly higher on sale items. Store prices differ

CIRCLE 196 ON READER SERVICE CARD

IBM, continued...

These centers are standard retail stores. You walk in and, assuming you can pay, you walk out with your equipment. For all equipment, including the Personal Computer, you can pay cash, use a company purchase order, or buy on the IBM installment plan. The installment plan is 25% down, one point above prime for the interest rate, and up to 36 months to pay. The Product Centers will also accept American Express, Diners Club, MasterCard, and Visa credit cards.

The Product Centers also carry supplies for the Personal Computer, including diskettes, printer ribbons, and printer paper. Repair service is available at all centers, as well as at service locations in Los Angeles, Seattle, Houston, Dallas, Boston, New York, Chicago, Detroit, and Washington. The product centers will not carry replacement heads for the printer, but will be able to order them. I mention this because the Epson MX80 print head is user-replaceable.

I'm sure it will come as no surprise to learn that IBM will sell the system at list price. No wheelin' and dealin' with IBM, folks. The standard price schedule is shown in Table 1.

IBM DPD

For customers of the Data Processing Division, or those wishing to purchase twenty or more systems, IBM will sell through a sub-organization within DPD. In essence, this means IBM will call on you to sell the machine, and that you can get a discount of from five to fifteen percent for quantities of from 20 to 150 units. The buyer must execute a one year Volume Purchase Agreement (VPA) with IBM and buy at least the minimum configuration, shown in Table 2. An Educational Allowance is available for qualifying educational institutions, provided that a VPA has been executed and that the allowance is greater than the VPA discount percentage.

IBM Service

When you buy your IBM Personal Computer, you get a 90-day warranty. A system which needs repair while under warranty must be delivered to one of IBM's designated service locations or IBM's National Support Center in Greencastle, IN. IBM's objective is to repair or replace the unit in one to two days, exclusive of shipping time. IBM will repair or replace at its option; the customer may request repair, but an additional fee is charged.

After the warranty period you're on your own unless you purchase what I like to call computer life insurance. The IBM service agreement costs about 13% of the purchase price of the computer per year. The exact figures for each component are shown in Table 1. One advantage of the service agreement is that IBM will arrange to have the unit picked up for repair and will deliver a replacement unit to the customer. IBM's objective is to deliver the replacement unit within 24 hours of receipt of the malfunctioning unit. Upon customer request, IBM will repair the unit, their objective being one to two days for repair. Pickup and delivery service is available in the service areas mentioned previously, within a 30-mile radius.

Customers outside the service radius can either carry their systems to the service location or ship them to the National Support Center. IBM's objective is to ship a replacement unit within 24 hours of receipt, or a repaired unit within two days.

Table 1. IBM Personal Computer Price List.

Component	**Price**	**Maintenance**
System Unit, Keyboard, 16K RAM	$1,265.00	$112.00
16K RAM Expansion Kit	90.00	8.00
32K RAM Expansion Board	325.00	40.50
64K RAM Expansion Board	540.00	122.00
Monochrome Display & Printer Adapter	335.00	20.00
IBM Monochrome Display	345.00	66.50
IBM 80 cps Matrix Printer	755.00	179.00
Color/Graphics Monitor Adapter	300.00	41.00
5 1/4" Diskette Drive Adapter	220.00	6.00
5 1/4" Diskette Drive, 160K	570.00	62.00
Asynchronous Communications Adapter	150.00	8.00
Game Control Adapter	55.00	1.50
Printer Cable	55.00	–
Printer Stand	55.00	–
Software		
IBM Personal Computer DOS	$ 40.00	
IBM Personal Computer Pascal Compiler	300.00	
Asynchronous Communications Support	40.00	
VisiCalc	200.00	
EasyWriter	175.00	
Peachtree Software		
General Ledger	595.00	
Accounts Receivable	595.00	
Accounts Payable	595.00	
Microsoft Adventure	30.00	
Advanced Diagnostics Package	155.00	

Note: Maintenance prices shown are for the "Annual Option" and represent the cost of service for a 12 month period. A "Warranty Extension" option is available at about 75% of the prices shown which extends the three month warranty to twelve months and which is only available in the first year of ownership. Service under either option is identical.

Table 2. Data Processing Division VPA Minimum Configuration.

Component	**Price**	**Maintenance**
System Unit, Keyboard, 16K RAM	$1,265.00	$112.00
16K RAM Expansion Kit (2 each)	180.00	16.00
Monochrome Display & Printer Adapter	335.00	20.00
IBM Monochrome Display	345.00	66.50
5 1/4" Diskette Adapter	220.00	6.00
5 1/4" Diskette Drive, 160K	570.00	62.00
Asynchronous Communications Adapter	150.00	8.00
IBM Personal Computer DOS	40.00	
Total	$3,105.00	$290.50

Plain Talk About Business Computers

Can a Small Computer Really Save You Time?

Time is Money

Theophrastus said time was the most valuable thing a man could spend. Fifteen centuries later Haliburton agreed saying, "we reckon hours and minutes to be dollars and cents." Today, time is more valuable than ever—and more fleeting.

About the only way to gain time is to use it more efficiently and effectively. That's where we come in.

Small Business Computers—by the way, the "small" refers to computers, not to business—will dramatically increase your effectiveness and help save you time and money. How so?

You get flagrantly honest evaluations and reviews of computers and software. We don't just tell you what a program can do; we tell you what it doesn't do, what it does poorly, and what it should do for the price. If advertisers don't like that, we don't want their business, and you're better off without them. Fortunately, most companies appreciate our honesty. In fact, one of our reviewers has gained a reputation because of the many software houses that have incorporated his suggestions into their products. We're proud of that.

Photo courtesy of Alanthus Data Communications Corp.

Plain Talk

Small Business Computers explains the complexity of today's computerized business world without the technical jargon and doubletalk that may have held you back before. In its easily comprehensible "how-to" style, *Small Business Computers* answers your questions while providing the information you need to make some tough decisions. As you select, purchase, and install your computer system, *Small Business Computers* will guide you through each step calmly and comfortably—helping you to evaluate your computer needs and avoid unnecessary pitfalls. As you use your computer, be it mini or micro, *Small Business Computers* will be there to help you do so efficiently and with confidence while informing you of the latest developments and future possibilities of computers in business.

For Example

You have just purchased a mailing list program. Everything is fine until the file has to be sorted by zip code. If the program has that capability, all is well. If not, you have a big problem. If you had just invested a few hours reading *Small Business Computers*, you would have known what functions to look for before buying the program; you would have known how to plan for future needs. That's just one example. Expand this concept into other areas, other programs and systems, and you can see what you get for your investment.

Added Expertise

As the newest member of the Creative Computing family of fine computer publications, *Small Business Computers* will be expanding to offer subscribers more valuable information than ever before. *Creative Computing* editors and contributors will be unleashing their business expertise in *Small Business Computers* through articles, evaluations and applications of particular interest to the business person. *Creative Computing* has a reputation of editorial excellence and integrity built on unbiased, in-depth product evaluations; articles by top thinkers in the field; and pragmatic, innovative applications.

One management consulting firm, for example, used the Shell-Metzner sort described in *Creative*, and saved $3000 a month, and we still receive letters thanking us for the hardhitting, candid, evaluation of word processing printers we published over a year ago, and which, incidentally, cost us several advertisers.

All this knowledge and experience will now be available to business people in *Small Business Computers*.

So, don't let anyone give you that old story about how complicated and difficult computers are. We don't buy that. Our magazine—our whole philosophy—revolves around the sharing of honest information. If you don't know where to start, we'll put you on the right track. If you're already on the road, we'll show you the best route.

For Any Size Business

Whatever your business—manufacturing or banking, retail or research—*Small Business Computers* will increase your efficiency and help save you time and money.

Subscribe today; *Small Business Computers* is the best consultant your business will ever have.

Order Today

To order your subscription to *Small Business Computers* send $12.00 for 1 year (6 issues). If you prefer, call our toll free number **800-631-8112** (in N.J. 201-540-0445) to put your subscription on your Master Card, Visa, or American Express card. Canadian and other foreign surface subscriptions are $18.00 per year and must be pre-paid. We guarantee that you will be completely satisfied or we will refund the remaining portion of your subscription.

Send orders to:

Small
Business Computers
Magazine

39 E. Hanover Ave.
Morris Plains, NJ 07950
800-631-8112
(In NJ 201-540-0445)

CIRCLE 290 ON READER SERVICE CARD

Sears Business Systems Center.

Personal Computers sent to IBM for repair must have all non-IBM "devices or features" removed. IBM wants the systems properly shipped, either in the original carton or an equivalent, and they will sell you replacement shipping containers for this purpose.

If you elect not to buy a service agreement and your machine dies, you can obtain "time and materials" service, but only from the National Support Center. Labor, parts, and transportation will be billed. Now I know it's tempting to take a chance—$400 to $600 seems like a lot of money for "life insurance." Take my word for it—if your machine has any serious problems you could easily spend twice the bucks in T&M.

Sears Business Systems Centers

The odds are that this won't work for most of you either, since there are only five stores in existence so far. Sears opened its first two Business Systems Centers this past October 7 in the Chicago suburbs of Arlington Heights and Villa Park, and followed them a week later with two more in Prestonwood and Caruth Shopping Mall in Dallas. The fifth store in Boston, was scheduled for mid to late November and should be open now. All five stores carry both Sears and national brands of computer systems, software, typewriters, word processors, printers, copiers, calculators, dictation and communications equipment, and supplies. The IBM Personal Computer is being sold along with the NEC PC-8000, Vector 2600 and 3005 systems, and the WangWriter 5503 word processor. Three Okidata dot matrix printers and two NEC Spinwriters are also available.

Sears is orienting these stores directly toward the small business and professional markets. Even their appearance, as shown in Figure 2, suggests this. Systems may be paid for with cash, on a "Net 30" invoice, on up to a three year installment plan, or with the Sears Credit Card. (This last means Sears isn't completely ignoring the consumer market, even though Atari computers were recently dropped from the catalog and the retail stores.) Sears will also provide service, both under warranty and under their own maintenance programs. They intend to do this work themselves and not use IBM resources such as the National Support Center.

Sears' pricing of the IBM Personal Computer is not available to me as I write this column. However, a Sears spokesman told me that they would not necessarily use the IBM price structure. I assume (hope?) this means that the individual stores are empowered to negotiate price, and not that Sears will charge more.

The Sears Business Systems Centers are a test. If they are successful, Sears plans to open a network of them nationwide. This is a very interesting possibility. Sears can bring several strengths to this new business. Its service network, although new to computer system repair, simply cannot be underestimated and is of enormous importance and value in today's more mature small business computer market. Nonetheless, Sears is the Johnny-come-lately in this business, and they have a tough, uphill battle, as you are about to see.

Computerland

The odds are that this *will* work for you! Computerland stores are individually owned and operated computer stores in a franchised network. The franchises are sold by Computerland Corporation of San Leandro, CA, which provides many services to its member stores. This network is very large. In October there were between 160 and 170 stores in the United States and another 40 in foreign countries. Computerland Corporation expects to close 1981 with 230 stores (15 openings per month!) and plans to add another 100 by the end of 1982.

I talked with Marion Murphy, the VP of operations, whose excitement about Computerland is contagious even over the telephone. What I learned was very interesting. Computerland gives a great deal of flexibility to the dealer while strongly influencing the overall style and strategy. Individual stores can do just about anything they please. They can carry whatever products they choose. They can refuse to carry products offered by the corporation. They are perfectly free to sell local third-party software. They can purchase outside Computerland Corporation.

However, for an 8% cut of the gross store sales, the corporation provides advantages, the most important of which is that Computerland buys products in volume and ships them to the stores *at cost*. This gives each dealer the same leverage as the entire network! It also gives the dealers a breadth of product that they otherwise could not afford to offer. This breadth of product includes Apple, Atari, Commodore, Northstar, Cromemco, Dynabyte, Xerox, WangWriter, Vector Graphic, and now IBM. Most stores usually carry at least Apple, Atari, Xerox, and Vector Graphic. About the only thing a store owner is discouraged from doing is mail order business.

Computerland stores accept cash, MasterCard, Visa, and American Express credit cards. Leasing programs are provided nationally and some stores have local leasing and financing arrangements.

One thing the stores must do to retain their franchise is service what they sell, and they must provide this service at the store location. Typical turnaround is one day if the system is under service contract and two to three days if it is not. A "Passport" program has been put into effect that identifies the bearer as a customer of Computerland and allows the customer to obtain the same level and speed of service at any Computerland store. I asked if the repair time objectives were met, and was told that they were typically being exceeded, as many repairs involved either quick adjustment or component swapping. The IBM Personal Computer will be serviced by the stores, although dealers are not discouraged from telling customers about IBM as an alternate service source.

Computerland has a central corporate program to certify new products, including software. A committee reviews suggestions from all sources, including stores. If a new product is approved by the committee, it is stocked and distributed to the stores from San Leandro. I think this is a very strong program because it means that cottage industry products, especially software, can percolate up to Computerland Corporation and out to a much broader audience than might otherwise be possible. This kind of thing can make a big difference during the early life of the IBM system.

Supplies are certainly no problem for Computerland, but IBM diskettes and ribbons will be carried nonetheless.

I learned some new things during my talk with Computerland. First, Computerland Stores will be getting something called the "spare parts kit" from IBM. I got this

data base

FINALLY, a copiable, user modifiable, flexible data base program for the Apple II or Apple II Plus. The Applesoft source code and the fast machine code sort element are open for user inspection and change. The package is also available with a BASIC language teaching program for use by "non-programmers".

CMA
Presents

The Features Include:

- 30,000 Word Manual
- 34 Page Annotated Source Listing
- Fast Sort Element (1,000 mailing labels in 3.5 seconds)
- 9,999 Records
- Byte by Byte Access
- File Management Utility
- Report Preparation Utility
- Quiry/Search Element
- File Transfer Utility
- Free Mailing List, Checkbook Utility, and Inventory Control Program
- (Optional) 17 Lesson Course in BASIC

THE REPROGRAMMABLE DATA BASE #D-075. $99.95

THE REPROGRAMMABLE DATA BASE PLUS (with 17 lesson BASIC course) #D-076. $149.95

CHECK YOUR LOCAL DEALER OR CONTACT:

CHARLES MANN & ASSOCIATES
55722 Santa Fe Trail
Yucca Valley, Ca. 92284
(714) 365-9718

CIRCLE 133 ON READER SERVICE CARD

DISK DRIVE WOES?
PRINTER INTERACTION?
MEMORY LOSS?
ERRATIC OPERATION?

Don't Blame The Software!

Power Line Spikes, Surges & Hash could be the culprit! Pat. #4,259,705

Floppies, printers, memory & processor often interact! Our patented ISOLATORS eliminate equipment interaction AND curb damaging Power Line Spikes, Surges and Hash.

- **ISOLATOR (ISO-1) 3 filter isolated 3-prong sockets; integral Surge/Spike Suppression; 1875 W Maximum load, 1 KW load any socket** **$62.95**
- **ISOLATOR (ISO-2) 2 filter isolated 3-prong socket banks; (6 sockets total); integral Spike/Surge Suppression; 1875 W Max load, 1 KW either bank** **$62.95**
- **SUPER ISOLATOR (ISO-3), similar to ISO-1 except double filtering & Suppression** **$94.95**
- **ISOLATOR (ISO-4), similar to ISO-1 except unit has 6 individually filtered sockets** **$106.95**
- **SUPER ISOLATOR (ISO-11) similar to ISO-2 except double filtering & Suppression** **$94.95**
- **CIRCUIT BREAKER, any model (add-CB)** . . . . **Add $ 8.00**
- **CKT BRKR/SWITCH/PILOT (-CBS)** . . . . **Add $16.00**

AT YOUR DEALERS

Master-Card, Visa, American Express
Order Toll Free 1-800-225-4876
(except AK, HI, PR & Canada)

ESP Electronic Specialists, Inc.
171 South Main Street, Natick, Mass. 01760
Technical & Non-800: 1-617-655-1532

CIRCLE 142 ON READER SERVICE CARD

MARKET ANALYSIS.

Easy. And Fast.

Programs for your personal computer.

STOCK TRACKER uses our technical volume analysis to give buy and sell signals on individual stocks, options and commodities. Telecommunications package optional.

MARKET TRACKER is a composite of six technical indicators which tell when the Dow turns bullish and bearish. Its four-year track record is available.

H & H
TRADING COMPANY
Post Office Box 549
Clayton, CA 94517
415/672-3233

CIRCLE 257 ON READER SERVICE CARD

Free. Fast. And a phone call away.

New
Micro Computer Supplies and Accessories Catalog.
Inmac

INMAC INTRODUCES THE SOLUTION TO YOUR MICRO SUPPLY AND ACCESSORY NEEDS.

- One-Stop Shopping. This new catalog offers over 1,000 products specifically for Micro Computers. Compatible with Apple, Atari, Northstar, TRS-80s and many others.
- Convenient Ordering. By mail or phone, ordering supplies and accessories from this catalog will be quick and easy.
- Fast Delivery. We'll ship your order within 24 hours from our distribution centers in New Jersey, California, Illinois and Texas. Overnight delivery available.
- Top Quality Products. Virtually all our products are guaranteed for at least one year. Risk-free trial of any product for 45 days.

Send for your FREE Inmac Catalog or call (408) 727-1970.

Inmac
Dept. Micro, 2465 Augustine Drive,
Santa Clara, CA 95051

CIRCLE 149 ON READER SERVICE CARD

information in answer to my question about stocking the Epson printer head for customer replacement. Computerland assumes the head will be part of this kit, although they couldn't say for sure. One thing is certain—they don't currently have the printer parts on hand because they don't sell Epson printers. (Sounds like heresy to me!) Computerland will also be selling an RF Modulator, which is needed to connect a standard TV set to the Color/Graphics adapter. And here's the next thing I learned: they claim (they are quite sure) that the one they have been selling all along for the Apple will work on the IBM machine.

There are some things that IBM does not offer that are needed by the consumer market. I had hoped Computerland would fill in this void with more than just the RF Modulator, but alas, no luck. They say they will have joysticks and paddles someday, as soon as they find a source. I didn't ask, but I'm sure the *do* have cassette recorders and cables. I'll keep you posted on developments in these areas and will publish the specifications for these devices as soon as I have them.

Computerland declined to give me a pricing structure. What they said, however, was that each independent dealer establishes his pricing and is able to negotiate. Careful now—I didn't say they would, just that they could. They could just as easily sell at list, firm.

Where Should I Buy Mine?

Now that you know who sells them, how do you decide how to choose your source? I think the answer is simple: you walk out of your home and go to your nearest computer store that sells the IBM Personal Computer. There is a 95% chance that it will be a Computerland Store.

If you have a choice, choose the least expensive store *after* you have determined that the store is fit to service your system.

Why Should I Buy One?

There is only one reason to buy a small computer nowadays. It's a reason that was "discovered" when VisiCalc was first published. It's a reason that has been printed between these covers many, many times. You buy a computer because you have found a piece of software that has some value to you and that software just happens to run on the computer you are buying.

Okay, so much for the sermon. Let's get serious about this.

"Why Should I Buy One?" Asked the Small Businessman

Please see above. Yep, that's right—the sermon was for you. If you want a computer system to help you in your business you had better know right up front what you expect it to do for you. You, more than most, must find the software you need and buy the machine to match it. If you can't find the software you need, one of two things is wrong: either what you need really isn't available "off-the-shelf," or you don't know what you need. The latter is more probable—go get yourself some help if you're still serious, but *don't buy that computer yet*!

If you read my evaluation of the IBM Personal Computer in last month's *Creative*, you know I think the machine is the cat's meow. But that doesn't mean a thing to you if you can't get the function you need out of it. Don't be seduced. Just think of $6,000 sitting on the shelf getting dusty. That six grand could mean a lot more to your business in other ways, maybe more than you should risk without knowing what your expected return will be.

Sears
BUSINESS SYSTEMS CENTER

Am I saying not to buy the IBM Personal Computer for small businesses? Not at all. If the general accounting software and VisiCalc will be useful, the capacities of the system suit your business, and the new way of doing things will be cost effective, I think it's a fine choice. But if you can't find useful software, look elsewhere. By the way, this situation will improve slowly as a body of software is developed for the machine. It takes a while—you may have to be very patient.

"Why Should I Buy One?" Asked the Big Businessman

The small business is usually after a general purpose computing system, one which can keep the books but also do other things. Larger businesses already have loads of equipment for those purposes. The trend now, and one which will have a lasting influence on the way we work, is the distribution of computing power into the hands of the worker. Just now, however, a single piece of software is focusing much attention on a particular segment of larger organizations: the accounting and financial departments. The software, of course, is VisiCalc.

The IBM Personal Computer is kind of an ultimate VisiCalc machine. Its great memory capacity means that large, complex models can be constructed. I have a rule of thumb which says that the VisiCalc worksheet has about 10,000 cells on a machine with 192K of main memory. That's enough for all but the largest, most demanding applications.

So VisiCalc, coupled with the fact that the IBM Personal Computer is easily integrated into the mainstream of data processing in most organizations, is the reason bigger businesses will buy.

I'd like to interject one comment about the IBM Personal Computer version of VisiCalc. At the time of writing, VisiCalc still has the memory limitations I described in my evaluation article, which is to say that it does not use all available memory if more than 96K of memory is installed. I have not been able to learn when the new version will be available. Besides supporting extended memory, the new release will most likely be bug free and tuned, and may even incorporate a new feature or two. My advice: wait for it, or make sure you don't have to buy it all over again when the new release is made.

"Why Should I Buy One?" Asked the Ordinary, Everyday Consumer

We haven't yet reached the point at which the everyday consumer casually buys a computer. The question would be more appropriate if worded "Now that I've decided to buy a personal computer, which one should I get?" I can't answer that for you without knowing, in too much detail thank you, what you want to do with it. However, let me take a moment to relate why I decided not to buy an Apple and turned instead to the IBM Personal Computer.

I spent a considerable amount of time looking around at what was available in the market over the last year. I found myself frustrated because I couldn't find a single computer that gave me everything I wanted. Finally, I worked up a configuration of an Apple II that I thought would suit. My "ultimate Apple" priced out at over $12,000, or about $5,000 without the Corvus hard disk and the Malibu Dual Mode 200 printer. How did I come up with a $5,000 Apple? My big problem was my ground rule that the system support word processing, and I knew I could not settle for a display screen size of less than 24 lines of 80 characters. On the other hand, I love computer games and I did not want to sacrifice spiffy graphics. So my Apple found itself full of Videx equipment to stretch the screen display and give the keyboard lower case letters. My second problem was some specific software I wanted that ran in CP/M. Enter, of course, the Microsoft Z80 Softcard.

So why didn't I buy it? Well, if you can accept this, it just didn't *feel* right. I was losing the Apple II under a pile of "subordinate" equipment—Rube Goldberg had nothing on that system. I just couldn't bring myself to start buying toward that end.

Thankfully, I was put out of my misery by the IBM announcement. The reason the Personal Computer is my salvation is that everything I want is there, and it's *integrated*! I don't have to sacrifice color graphics for a good text display, or vice versa. I don't have to adapt the machine to speak lower case. I won't have to worry about whether software will talk properly to this device or the other. And the best of all, I don't have to buy a huge configuration to get these things—they come in every configuration.

Most of you probably know that love hurts. In the case of the IBM Personal Computer, it's worse than that, it's agony. There is virtually no software. No Raster Blaster or Invaders or Dancing Demon or Star Raiders. No checkbook program. No home finance system. No Air Traffic Controller. Yes, the list of software that's missing from this system is endless. That's the price you pay for being on the leading edge. You wait.

I don't think we'll have to wait too long. I think the Personal Computer will sell relatively well in the home market for two reasons. The first is the name and image of IBM. There's a great deal of computer shock out there, and the company whose name is virtually synonymous with the word "computer" is going to overcome some of that. A legendary reputation for reliability won't hurt either. The other reason is that the IBM system holds up pretty well in a head-to-head comparison with the Apple II/II+. The IBM is more expensive, but you do get something for that extra money.

IBM vs Apple II

I came up with a quick comparison for my own purposes that I'd like to pass on. I've included the complete IBM price list in Table 1 so you can do your own configuration studies.

What I considered was an Apple II+ with 48K RAM against an IBM with 32K RAM and the Color/Graphics Adapter. The price of the Apple II is $1,530; the IBM is $1,655. Surprised? The reason I allowed the IBM to have less main memory is because the Color/Graphics adapter has 16K of RAM onboard for the display memory, while the Apple must sacrifice some of its program space for display memory. If the IBM is increased to 48K, its price rises to $1,745. For that $215 you get a better keyboard; upper and lower case; 24 by 80 display capability; a steel, rather than plastic, housing for the system; tremendous memory expandability; and more. To be completely fair, a $55 Game Control Adapter is required to allow connection of joysticks, or game paddles to the IBM. I won't bore you with my (obvious) conclusion.

Thanks for reading. I'll see you next month. ☐

PLAIN TALK ABOUT "COPY PROTECTION"

A lot has been said and written about copy protection and software piracy since Omega made Locksmith available to Apple II users earlier this year. We have been accused of encouraging illegal copying of copyrighted software. Software publishers have threatened to boycott magazines which carry our advertising, and the pros and cons of Locksmith and copy protection devices have been debated in Apple forums throughout the country. But, we at Omega haven't really told you, the Apple user, our side of the story.

Locksmith was originally developed as an intellectual exercise by an Apple user over a year ago. And we suspect that sufficient information about the Apple DOS and the way information is stored on a disk has been long available to the general public, so that ANYONE who was REALLY interested, and who wished to spend a LOT of time, could have written a program that does many of the things that Locksmith does. Similarly, there is really no "secret" to writing data base programs, adventure programs, or even spread sheet programs. The literature is there if you want to look for it. But it takes a lot of hard work to develop any software package that works in all cases, that is crashproof, that interfaces easily with a non-experienced computer user, and that is well documented. A LOT of hard work.

But even before Locksmith was available to us, we, as Apple users, recognized a definite problem with the software we were buying and using. Much of it worked well. But it was very aggravating to not be able to make a backup copy of certain "copy protected" programs. Most software pubishers didn't supply backups of their programs, and those that had any policy required signing opressive agreements or paying questionably high yearly fees for presumed, but not guaranteed, updates. Among those who did not offer back-up was one who 'sold' us a new copy (when we returned our crashed disk). Although they advertised the importance of having their program running every day, they made us wait up to 6 weeks to get the replacement. Most vendors just ignored the problem. We, as consumers, were simply taken advantage of. In many cases we relied so much on a particular program, that it became very costly to have to wait weeks or more to replace a blown disk. Software publishers were just not responsive to the users problems caused by "copy protection".

When we first became aware of Locksmith, we investigated the state of the law, and discovered that no one knew whether the owner of a program could copy it for backup. And for quite a while we debated whether we should market Locksmith.

On December 12, 1980, a change was made to the Copyright Act which resolved these questions. It is now the law of the United States that the existence of a copyright notice on a computer program does NOT make it illegal for the legitimate owner of that program to copy it for archival purposes. Backups are now clearly legal. (Of course, when you sell your purchased program, you must destroy the backups you have made). Only after such use clearly became legal did we decide to sell Locksmith.

Now with the new copyright law, which for the first time gave software publishers clear rights that were enforceable in court, but which also gave "backup" rights to software purchasers, and with the demonstration that Locksmith could and would provide back-up for the user, we assumed that software publishers would drop their copy protection schemes and educate the public as to their rights and responsibilities. Even the use of hardware protection that gives copy-ability to the software would be acceptable. Unfortunately, their response has been to pressure magazine publishers into refusing our advertising, and to invent new copy protection schemes.

Well, the word about Locksmith was impossible to stop. We couldn't advertise, but we have sold a gratifyingly large number of programs. As to new copy protection schemes, the new Locksmith (version 4.0) will adjust to them, and copy virtually anything protected that way. But please. For us, for yourselves, and for the entire industry, use Locksmith only for its intended legal purposes.

The new version is more than just the best copy program available. There are also four additional utilities included. A disk speed program, a degauasser, a nibble editor and a media surface analyzer are included. And we stand behind our products. Our customer service department is available (and anxious) to help with problems.

Locksmith 4.0 is available from us, or your local dealer. Visa and Mastercard users call Toll Free 1-800-835-2246. Kansas residents call 1-800-362-2421 or send $99.95. (Registered owners of prior versions can obtain an update for only $20. If you haven't received a letter from us, please call.)

Another Quality Product from
Omega MicroWare, Inc.
(formerly Omega Software
Products, Inc.)
222 So. Riverside Plaza
Chicago, IL 60606
Phone 312-648-1944

©1981 Omega MicroWare, Inc.
Apple is a registered trademark of Apple Computer, Inc.

CIRCLE 201 ON READER SERVICE CARD

Harold Novick

m...software legal forum...s

The comments and opinions of the author are given for education purposes only and are not meant to be legal advice. Specific legal questions should be referred to your personal attorney.

Now that Midway Manufacturing Co. has literally shot down every infringer of its coin-operated game "Galaxian," just as a player shoots down the invading aliens, others in the field have joined the fracas to establish their own turf. For example, Atari, Inc. has announced their intentions to the trade, in general, and to numerous software dealers, software houses, and software producers, in particular, that they will take aim against all copiers of their copyrighted games. Their position has been further strengthened as a result of a recent court decision holding that duplication of a ROM storing a copyrighted computer program is a copyright infringement.

As a quick update, in the October, 1981 Software Legal Forum, there was a discussion of the attempts by Midway to protect its "Galaxian" game. Midway was confronted with no less than twenty copied variations of its game being imported into the United States. Midway filed an action in early 1980 before the International Trade Commission to stop these infringers. The action was based on common-law trademark infringement, passing off, imitation of trade dress, and false designation of origin. Five months later, on October 8, 1980, the action was amended to add copyright infringement. After hearing arguments, the Commission issued its order on June 25, 1981 to exclude the "certain coin-operated audio-visual games, kits and components thereof which infringe Midway's) attract mode and the first few moments of the play mode before the player takes control of the game...." (In the Matter of Coin-Operated Audio-Visual Games and Components Thereof, United States International Trade Commission Investigation No. 337-TA-87).

The "Galaxian" game has an "attract mode" and a "play mode." The attract mode is a short sequence of images designed to attract potential players to the game and to encourage them to play it. About one-third of the attract mode is a randomly selected, non-repeatable simulated game that ends with the destruction of the rocket base's defense ship. The play mode begins when a player inserts a coin into the game. When a coin is inserted and before the player's controls are activated the screen is first blanked and then the top half is sequentially filled with an attacking array of aliens. As soon as the aliens are in position, the player can control the lateral movement of the defense ship and fire missiles at the array of stationary aliens or a group of aliens that peel off from the group and attack the defense ship.

The interesting legal issues in the Galaxian case arise because Midway did not register any copyright claim to the computer program. Instead, it videotaped the attract mode with a particular one of the simulated games and videotaped an entire game played by a player. Midway then obtained registrations of its claims to copyrights on these "audio-visual works." The infringers probably never saw the copyrighted tapes, and some accused infringers wrote their own computer program and did not copy the Galaxian ROM. Thus, if an infringer never had access to the copyrighted work (the video tapes), how could there be an infringement? What did Midway copyright anyway? Also, if the player constitutes an active participant in the play mode, the player may be a co-author of an original work resulting in the displayed audiovisual presentation. As a co-author, the player is not liable for infringement. The game manufacturer may also not be liable.

The International Trade Commission only discussed some of these points in its decision. A crucial point, however, is that none of the respondents participated in the proceeding. All Midway had to do to win, which it did, was to prove its *prima facie* case. The ITC held that Midway made the dual requisite for copyright infringement of ownership of the copyright in question and copying by the respondents. Thus the Commission held there was copyright infringement.

More specifically, the ITC found that Midway established ownership by showing that:

1. Originality was in the author (Namco Ltd. of Japan);
2. The subject matter was copyrightable;
3. The author had the necessary citizenship so as to permit a claim of copyright;
4. There was a compliance with the statutory formalities (application, fee, deposit of a copy);
5. Midway was a valid copyright claimant as a result of a transfer of rights from the author.

The only questionable contention under the ownership element of infringement appears to be copyrightability of the subject matter. By law (The Copyright Act of 1976 § 410(c)), the certificate of registration constitutes a rebuttable presumption that the copyright is valid. There being no rebutting evidence, the ITC had to find that the subject matter was copyrightable. There is no argument so far. Disagreement enters, however, when one asks what is that subject matter? The certificates of copyright registration (one for the attract mode and one for the play mode) recite that the claim of copyright extends to all audiovisual or cinematographic works. This is not a computer program! This is not a computer video game!

In any event, the Commission recognized the limitations in this proceeding because there was no defense. Thus they specifically said there were some significant issues that were left unresolved. These issues included:

1. Whether an audiovisual work is an "original work of authorship" or whether it is derived from another original work.
2. Whether the videotapes are a fixation of the original work of authorship or whether they are a "photograph" of a fixed copy of the original work.
3. For purposes of determining the proper form of deposit and registration, whether the work was first published in Japan or the United States.

The other half of the copyright infringe-

Harold L. Novick, Patent Attorney, Larson & Taylor, Arlington, VA 22202.

NEW PRINTERS. NEW PERIPHERALS. SAME OLD RELIABLE QUALITY AND VALUE.

1982 will find more OEM's, businesses, dealers and personal computer users turning to MICROTEK than ever before.

TekWriter-1

80 Column Dot Matrix Printer

(Formerly BYTEWRITER-1)

The Tekwriter-1 printer is, dollar for dollar, the finest value in the industry. And we've proved it by comparing the Tekwriter-1 to the Epson MX-80. Our print speed is 14 lines per minute faster, our life expectancy is longer, the character sets are the same, and the interface, warranty and printhead replacement cost are all identical.* But the biggest difference is the price. The Tekwriter-1 is about $300 less.

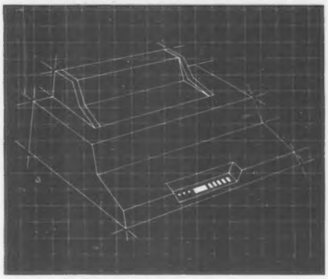
Our extensive testing has proved that the Tekwriter-1 interfaces problem-free to the TRS-80, the Apple II and the Atari 400 and 800.

The Tekwriter-1 is tough to beat for performance and quality.

*Data Source: Epson MX-800 Operation Manual

$349

TekWriter-2



NEW! 80/132 Column Dot Mattix Printer

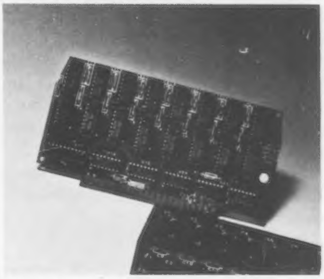
The Tekwriter-2 is perfectly suited to personal, business or OEM applications. Tekwriter-2 is designed to accept single sheet, roll or pin feed paper. It has a 9-wire dot matrix impact print head which produces crisp characters and has underlining capability. The printer is manufactured to run extremely quietly even while operating at peak output levels.

Tekwriter-2 is especially well suited to handle an abundance of text entry because of its data buffer expansion capability to 25K. This ability makes it an efficient graphics generator.

Parallel interface (Centronics type). Interfaces all models of TRS-80, Apple, and Atari 400/800, and most computers with Centronics printer interface.

$695

Peripherals



16K Memory Board, AMB-16

16K 4116 RAM (200NS) • Assembled and tested • No modifications — hardware or software • Compatible with Atari 800

32K Memory Board, AMB-32

32K 4116 RAM (200NS) • Assembled and tested • No modifications — hardware or software • Compatible with Atari 400/800

Atari (RS-232) Serial Printer Cable

Pre-tested • 3′ length • DB15 to DB25 connectors

Atari Parallel Printer Cable

Pre-tested • 3′ length • Centronics compatible • DB15 to Amphenol 57-30360

16K Apple Memory Card

Expands Apple II to 64K RAM memory. Works with MICROSOFT Z-80 Softcard, Apple PASCAL and Visicalc software.

Quantity and OEM discounts available.

Continuing our quest for excellence.

TRS-80 is a trademark of Radio Shack, Inc.
Apple II is a trademark of Apple Computer, Inc.
Atari 400/800 are trademarks of Atari, Inc.
Microsoft is a trademark of Microsoft Consumer Products, Inc.
Z-80 is a trademark of Zilog, Inc.
Visicalc is a trademark of Personal Software, Inc.

MICROTEK inc.

CIRCLE 342 ON READER SERVICE CARD

MICROTEK
9514 Chesapeake Drive
San Diego, CA 92123
(714) 278-0633
Outside CA call
Toll Free (800) 854-1081
TWX. 910-335-1269

Legal Forum, continued...

ment proof is a showing that the copyrighted work was copied by the respondents. In the absence of direct evidence of copying (e.g. the respondents admit it, or someone testifies that they witnessed the copying), an inference of copying can be created by proving the respondents had access to the copyrighted work and there is a substantial similarity between the two works. Again, because the respondents did not respond, the ITC held that Midway had won because it had established inference.

The ITC held that respondents had access because the *game* (not the videotapes) had been displayed at two trade shows and had been available in the marketplace for some time. Then, in a *non sequitur*, the ITC held that the respondents "had access to the complainant's work." That holding seems to say that the game is copyrightable, which according to numerous court cases it cannot be.

The element of "substantial similarity" was found because "the attract modes of each of the alleged infringing games except Moon Alien are almost identical to the attract mode of complainant's Galaxian game." The ITC applied the ordinary observer test used in fabric design copyright cases: "Would an ordinary observer, who is not attempting to discover disparities, be disposed to overlook them and regard their aesthetic appeal as the same?" The ITC also applied two, two step applications of the test. They said that 1) the respondents copied the work and that copying constituted appropriation; and 2) there was a substantial similarity between the "general ideas" of the two works and that similarity of general ideas constituted infringement upon analysis of the response of an ordinary reasonable person.

With respect to the Moon Alien game, the ITC also held there was substantial copying, even though it has its own "original works of authorship which are apparently unique." However, the Moon Alien game had enough similar significant aspects so as to constitute the same aesthetic appeal when overlooking the disparities. These are as follows:

1. The rolling star background;
2. The shape and color of the aliens in the simulated game;
3. The formation of the aliens in the simulated game and its placement on the display screen;
4. The movement of the aliens both while in formation and while swooping down in attack; and
5. The scoring table, including the manner in which it is brought into display on the screen, the wording contained, and the flashing score values.

The second aspect of this Forum complements the Galaxian case. A judge in the Northern District of California held that the ROM's of plaintiff can be considered copies of copyrighted computer programs. Therefore, when defendants duplicated the program and only changed some minor items that specifically identified the owner of the program, they infringed the copyright. *(Tandy Corp. v. Personal Micro Computers, Inc.*, 546 PTCJ (9-17-81) A-4 (N.D. Calif. 1981)). The judge specifically disagreed with the Chicago judge in the Data Cash Systems case (the Compuchess case discussed in several earlier Software Legal Forums.) Specifically, the judge said as follows:

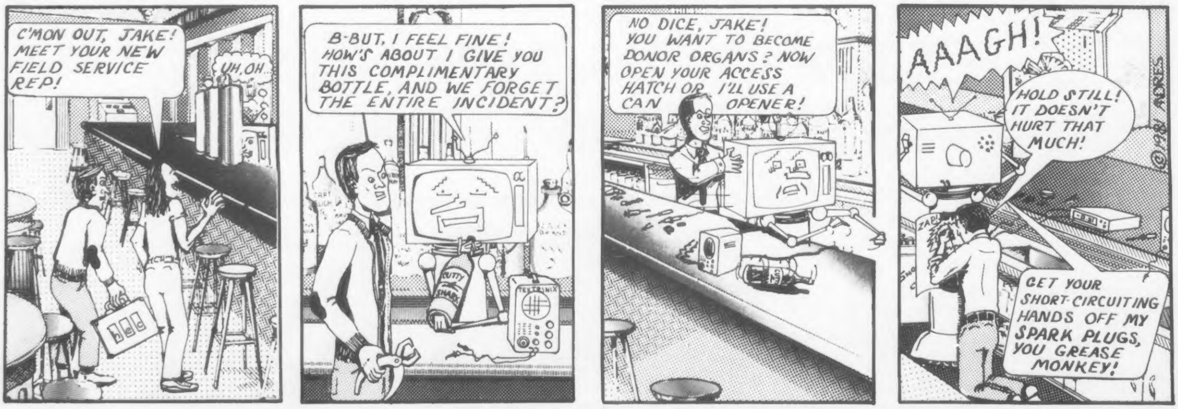
> There is no dispute that the court is to initially look to the Copyright Act which was passed by Congress in 1976 and went into effect on January 1, 1978. Looking first to sections 101 and 102 of that Act, 17 U.S.C. §101, §102, the court is convinced that under those provisions (1) a computer program is a "work of authorship" subject to copyright, and (2) that a silicon chip is "tangible medium of expression," within the meaning of the statute, such as to make a program fixed in that forum subject to the copyright laws.
>
> Section 117, as it existed in the 1976 act [, 117 was amended in 1980, does not mandate a different result. Section 117] was not intended to provide a loophole by which someone could duplicate a computer program fixed on a silicon chip. It did not refer to the unauthorized duplication of a silicon chip upon which a properly copyrighted computer program is imprinted...[A]ny other interpretation would render the theoretical ability to copyright computer programs virtually meaningless.

With these two decisions and the active litigating interest of other software game owners, it seems that all copiers of video games better beware. One can no longer view the play of one copyrighted video game, write his or her own program to closely copy the game, sell the computer program, and expect to get off scot-free. Although it is believed that the legal reasoning may be muddy or even incorrect, it is clear that the legal consequences will favor the game originator.

P.S.: On October 16th, 1981, the Patent Trademark Office announced that it was accepting and granting patents on computer programs that were novel and unobvious according to the guidelines set down by the Court of Customs and Patent Appeals. These guidelines were discussed in earlier Software Legal Forums. Basically, the Patent and Trademark Office is applying the two-step test of *In re Freeman* as modified by the decision in *In re Walter*. The two-step test basically asks whether the computer program is merely solving a mathematical equation. Finally, the Patent and Trademark Office has given up its prior restrictive position. More about this in subsequent Forums. ☐

Bit Pit

Chas Andres


C'MON OUT, JAKE! MEET YOUR NEW FIELD SERVICE REP!
UH, OH...
B-BUT, I FEEL FINE! HOW'S ABOUT I GIVE YOU THIS COMPLIMENTARY BOTTLE, AND WE FORGET THE ENTIRE INCIDENT?
NO DICE, JAKE! YOU WANT TO BECOME DONOR ORGANS? NOW OPEN YOUR ACCESS HATCH OR I'LL USE A CAN OPENER!
AAAGH!
HOLD STILL! IT DOESN'T HURT THAT MUCH!
GET YOUR SHORT-CIRCUITING HANDS OFF MY SPARK PLUGS, YOU GREASE MONKEY!
©1981 ANDRES

ROAD WORK
creative computing software
creative computing

Help Wanted Be an indendent trucker or manage a city transportation department with these two award winning simulations!

Driver Wanted: Tired of being told what to do? Be an independent trucker and manage your own life! Haul oranges, frieght, or mail from California to New York. Healthy, safe driver desired, able to cope with bad weather, road construction, flat tires, fatigue, and the highway patrol. Contact Trucker for details.

Transportation manager for city of Grand Rapids, Michigan. Are you the dynamic executive we need to construct and maintain our streets and operate the city bus company? Experience desired in planning, budgeting, finance, labor negotiations, poitical liason, and tax policy. Apply to Streets of the City.

TRUCKER AND STREETS OF THE CITY

CS 4710 32K Applesoft Disk

CS 7707 40K Atari Disk

CS 3703 32K TRS-80 Disk

CS 1204 32K PET tape

ANY ONE FOR **$24.95**

Order Today

To order any of these software packages. send payment plus $2.00 postage and handling per order to Creative Computing. Morris Plains. NJ 07950. Visa. MasterCard and American Express orders may be called in toll-free.

Order today at no risk. If you are not completely satisfied. your money will be promptly and courteously refunded

Creative Computing Software
Morris Plains. NJ 07950
Toll-free **800-631-8112**
In NJ. 201-540-0445

creative computing software

ComputerVille

SHOP BY PHONE
IMMEDIATE DELIVERY
Toll Free 800-258-1551
IN NEW HAMPSHIRE CALL COLLECT 880-1980

Diskettes
TESTED - CERTIFIED - GUARANTEED

CALL FOR PRICES

NAME BRANDS FEATURING
MEMOREX®
maxell®
Verbatim®

FULLY COMPATIBLE
- APPLE
- TRS 80
- IBM
- ALL OTHER 5 1/4" AND 8" DRIVES

HEAD CLEANING KITS – STORAGE SYSTEMS

Printwheels
QUME AND DIABLO – COMPATIBLE
IN MOST POPULAR FONTS

Ribbons
BRAND NEW
TOP QUALITY
FABRIC/FILM
COMPATIBLE WITH HUNDREDS OF PRINTERS

Paper
ALL SIZES,
COLORS,
WEIGHTS
SHIPPED
DIRECT FROM
OUR REGIONAL
WAREHOUSES

©1981
Computer Products Unlimited, Inc.
GENERAL OFFICES
COLUMBIA DRIVE
AMHERST, NH 03031

DEALER INQUIRIES WELCOME

master charge
VISA®

C.O.D.
WE SHIP ANYWHERE

CIRCLE 132 ON READER SERVICE CARD

MICROMAIL™

CRT'S • PRINTERS • TELEPRINTERS

TELEVIDEO		**DIABLO**		**ANADEX**	
910		630		DP-9500/9501	
$569.00		$1950.00		$1279.00	
912	CALL	1640	CALL	9000/9001 & 8000	CALL
920	CALL	1650	CALL		
950	CALL				

CALL FOR OUR LOW PRICES ON

QUME, NEC, T.I., DEC
TELETYPE, SOROC, C.ITOH

TOLL FREE (800) 854-6028

To Order: Send check to MICROMAIL, P.O. Box 3297, Santa Ana, CA 92703. Personal or company checks require two weeks to clear. Visa/MasterCard accepted. C.O.D. requires a 15% deposit.
Handling: Add 3% to orders less than $750, 2% to order $751–$2,000, 1% to orders over $2,000. NOTE: Handling charges are waived on orders pre-paid in advance by check.
Shipping: We ship FREIGHT COLLECT via UPS or Motor Freight. Air and Express delivery is available. **Prices subject to change without notice.**

INTERNATIONAL ORDERS WELCOME
TWX, WRITE or CALL

MICROMAIL
P.O. Box 3297
Santa Ana, CA 92703
Phone: 714/731-4338
TWX: 910 595 1148

CIRCLE 210 ON READER SERVICE CARD

rings...trs-80 strings...trs-8

Stephen B. Gray

As the curtain goes up on the 36th performance of the TRS-80 Follies (where did those three years go so fast?), we see that most of the show is about graphics, starting with a program that creates a wandering pattern in both B&W and color, goes into a subroutine for storing graphics, shows how to create blank lines between program lines, reviews Sketch-80, and rings down the curtain with pretty patterns created by a four-way random-graphics shorty.

Graphics: Wandering Pixel

Although many of the graphics programs that create symmetrical patterns can be fascinatingly hypnotic, the patterns are usually predictable enough so that eventually you may lose interest in them.

Here's a simple program that lets a pixel (graphics-block picture element) wander completely at random, all over the screen, in Rorschach-like figures you may find even more hypnotic than regular patterns.

```
100 CLS: REM--WANDERING PIXEL--
110 X=RND(128)-1
120 Y=RND(48)-1
130 SET(X,Y)
140 A=RND(4)
150 ON A GOTO 160,170,180,190
160 X=X+1: GOTO 200
170 Y=Y+1: GOTO 200
180 X=X-1: GOTO 200
190 Y=Y-1
200 IF X<0 THEN X=127: GOTO 130
210 IF X>127 THEN X=0: GOTO 130
220 IF Y<0 THEN Y=47: GOTO 130
230 IF Y>47 THEN Y=0: GOTO 130
240 GOTO 130
```

Lines 160-190 can be made more efficient. Can you see how?

To make this pattern four-way symmetrical, change or add the following lines:

```
110 X=RND(64)-1
120 Y=RND(24)-1

131 SET(X,47-Y)
132 SET(127-X,Y)
133 SET(127-X,47-Y)

200 IF X<0 THEN X=63: GOTO 130
210 IF X>63 THEN X=0: GOTO 130
220 IF Y<0 THEN Y=23: GOTO 130
230 IF Y>23 THEN Y=0: GOTO 130
```

These programs are only a start. See if you can change them so they will:

- Turn off any lighted pixel they meet up with;
- Clear the screen after filling it fairly full, and start over;
- Create a continuous path, without the wraparounds used here (lines 200-230);
- Create a "wandering graphics character" program, using either the solid six-pixel block (code 191) or randomly selecting from among the 63 characters;
- Start the pattern near the center of the graphics area, and/or confine it to a smaller area;
- Change the randomness of the pattern by adding to the ON/GOTO section.

This wandering-pixel program usually creates patterns that are predominantly in the center portion of the graphics area. For patterns that are often created around the periphery of the graphics area, change lines 200-230 to

```
200 IF X<0 THEN X=X+128: GOTO 130
210 IF X>127 THEN X=X-128: GOTO 130
220 IF Y<0 THEN Y=Y+48: GOTO 130
230 IF Y>47 THEN Y=Y-48: GOTO 130
```

Can you figure out why the patterns created with these two sets of lines 200-230 are often so different?

CC Changes

Frederick Cunningham of Stamford, CT asks "When you publish a TRS-80 program could you include the necessary changes to run on the Color Computer? A few simple changes of the program in the July issue produced a program that my children have named City."

To run that July 1981 (p. 212) program:

- Change CLS to CLS 0
- Change the graphics-area limits from 128 and 48, to 64 and 32
- Add 165 C=RND(8)
- Change line 200 to SET(J,K,C).

The CLS 0 turns the screen black instead of green, and the added line makes each random rectangle a random color.

Wandering Color-Pixel

For those who are just starting in with the color Computer, here's the basic Wandering Pixel program in color:

TRS-80 LEVEL II

Investment Analysis

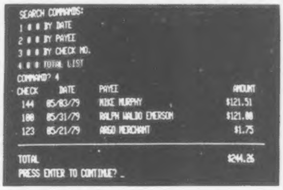
CS-3305 Cassette (32K) $24.95

This program was originally developed for personal use by an investment specialist. Creative Computing Software now makes this package available for you to analyze your investments and investment decisions. Programs in this package include regression analysis, stock market simulations, market/stock values, risk analysis, time related investments, and tax analysis.

Checking Account

CS-3304 Cassette (16K) $11.95
CS-3504 Disk (32K) $24.95
(Disk includes Text Processing, CS-3302)

This program does not replace the standard method of checkbook balancing. Instead it acts as an aid in keeping track of individual and monthly expenses. You enter the amounts and payees of individual checks, and save the information on cassette tape. The program then allows you to analyze your checks by payee or date of payment. Keep track of where your money is going and how effective your budget is.



```
SEARCH COMMANDS:
1 # # BY DATE
2 # # BY PAYEE
3 # # BY CHECK NO.
4 # # TOTAL LIST
COMMAND? 4
CHECK    DATE      PAYEE                     AMOUNT
 144   05/03/79   MIKE MURPHY               $121.51
 100   05/31/79   RALPH WALDO EMERSON       $121.00
 123   05/21/79   ARGO MERCHANT               $1.75
---------------------------------------------------
TOTAL                                       $244.26
PRESS ENTER TO CONTINUE? _
```

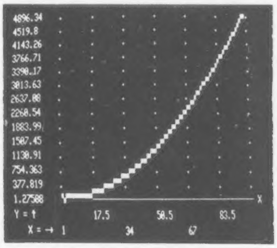
Graphic Package

CS-3301 Cassette (4K) $11.95
CS-3801 Diskette (32K) $19.95

This package provides a variety of interesting and useful graphing routines. Graphing Package combines text and TRS-80 graphics to plot a variety of functions and other graphs.

1. Bar Graph

Bar Graph plots graphs for up to six different categories. An optional display does conversion to a line graph.

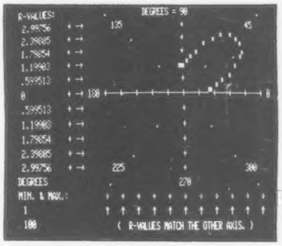


2. Cartesian Coordinate Graphing

This program plots a standard X, Y graph from a user entered function. A special feature of this program automatically scales of the Y-axis.

3. Polar Coordinate Graphing

Rarely found in computer graphing packages, this polar graphing program provides plots of polar functions. The program labels all axes, features automatic scaling, and lets you input the range and increment of the plot. A unique and valuable program.



4. Parametric Graphing

Parametric functions are functions in which both x and y are expressed in terms of an independent variable t. The resulting graph is X vs. Y. This program allows the user to input two parametric functions and produces a graph.

5. Linear and Parabolic Regression

These two programs are used for data analysis which can later be entered into the graphing routines. Regression routines analyze how well a series of points fit on a linear or quadratic function.

Advanced Statistics

CS-3303 Cassette (16K) $24.95 CS-3505 Disk (32K) $24.95

This package may be the ultimate in statistical applications for the 16K TRS-80. Attractively packaged in a vinyl binder with a large instruction booklet, Advanced Statistics will provide you with the ability to perform statistical tests never before available on small computers. Its cassette based data file system allows you to store, retrieve, and transform data files for use in several different tests.

1. Tape Manager

Tape Manager, the heart of the statistical file management, allows you to create, edit, and transform data files. Unique to this program are features that allow the user to perform transformations on variables, extract and create subfiles, and selectively copy records. Up to twenty variables and an unlimited number of cases can be processed.

2. Descriptive Statistics

Descriptive Statistics computes the mean, standard deviation, standard error of estimate, variance, skewness, kurtosis, range, median, and quartiles for a variable and constructs a histogram for each value. A test scoring option for conversion of raw scores into percentiles is included.

3. Two Variable Statistics

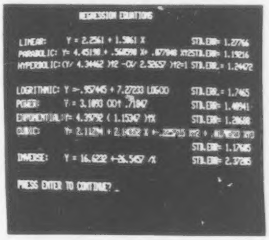
This program calculates descriptive statistics for each variable. It performs a t-test for the difference of means, computing the product-moment correlation coefficient and its associated significance level. In addition, it performs linear regression and computes standard error of estimate for Y.

4. Crosstabulation

This program constructs contingency tables for displaying frequencies, column percentages and table-wide percentages for each cell. It computes the Chi-square, the level of significance and gamma statistics. Tables as large as 10x10 may be evaluated.

5. Regression-Trend Analysis

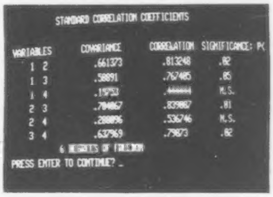
This program computes least-squares regression coefficients from time-series or paired data for best-fit equations (linear, parabolic, hyperbolic, logarithmic, power, exponential and cubic types). Calculates standard error of estimate for each equation and more.



```
              REGRESSION EQUATIONS

LINEAR:      Y = 2.2561 + 1.5061 X            STD.ERR= 1.27766
PARABOLIC: Y= 4.45198 + .560598 X+ .077948 X↑2STD.ERR= 1.19216
HYPERBOLIC:(Y/ 4.34462 )↑2 -(X/ 2.52657 )↑2=1 STD.ERR.= 1.24472

LOGRITHMIC: Y =-.957445 + 7.27233 LOG(X)      STD.ERR.= 1.7465
POWER:       Y = 3.1093 (X)↑ .71047            STD.ERR= 1.40941
EXPONENTIAL:Y= 4.39792 ( 1.15347 )↑X          STD.ERR= 1.20608
CUBIC:       Y= 2.11294 + 2.14352 X +-.225715 X↑2 + [illegible] X↑3
                                              STD.ERR= 1.17605
INVERSE:     Y = 16.6232 +-26.5457 /X         STD.ERR= 2.37285

PRESS ENTER TO CONTINUE? _
```

6. Multiple Linear Regression

Performs multiple linear regression using up to ten independent variables. The program computes both unstandardized and normalized coefficients, covariance, multiple correlation coefficient, and the standard error of estimate.



```
        STANDARD CORRELATION COEFFICIENTS

VARIABLES      COVARIANCE     CORRELATION  SIGNIFICANCE: P<
   1  2          .661373        .813248        .02
   1  3          .58891         .767405        .05
   1  4          .19753         .444444        N.S.
   2  3          .704067        .839087        .01
   2  4          .288096        .536746        N.S.
   3  4          .637969        .79873         .02
           6 DEGREES OF FREEDOM
PRESS ENTER TO CONTINUE? _
```

7. Correlation Analysis

Computes product-moment correlation matrices, multiple correlation coefficients and partial correlation coefficients with their associated significance levels.

8. Analysis of Variance

This program performs one-way and two-way analysis of variance for a maximum of ten groups in each control variable. Statistics include the mean and standard deviation for each group, sum of the squares, degrees of freedom, mean square, F-ratios, and significance level.

Order Today

To order any of these software packages, send payment plus $2.00 postage and handling per order to Creative Computing, Morris Plains, NJ 07950. Visa, MasterCard and American Express orders may be called in toll-free.

Order today at no risk. If you are not completely satisfied, your money will be promptly and courteously refunded.

Creative Computing Software
Morris Plains, NJ 07950
Toll-free **800-631-8112**
In NJ, 201-540-0445

creative computing software

TRS-80 is the registered trademark of Tandy Corp

CIRCLE 350 ON READER SERVICE CARD

TRS-80, continued...

```
100 CLS 0:'--WANDERING COLOR--
110 X=RND(64)-1
120 Y=RND(32)-1
130 SET(X,Y,C)
135 C=RND(8)
140 A=RND(4)
150 ON A GOTO 160,170,180,190
160 X=X+1: GOTO 200
170 Y=Y+1: GOTO 200
180 X=X-1: GOTO 200
190 Y=Y-1
200 IF X<0 THEN X=63: GOTO 130
210 IF X>63 THEN X=0: GOTO 130
220 IF Y<0 THEN Y=31: GOTO 130
230 IF Y>63 THEN Y=0: GOTO 130
240 GOTO 130
```

Note that the differences are the same as for the City program: the CLS statement needs a zero; the graphics area is smaller; you add another RND function, for random color; and you insert the color factor in the SET line.

Although this has the nice effect of changing the color of blocks previously set, you may be interested in looking at the black-and-white version. For an approximation, delete line 135, make line 130 read

130 SET(X,Y,0)

and set the color controls so the display is in black and white. You may find this more interesting at the higher resolutions, if you have 16K of memory and Extended Basic, and can rewrite the program accordingly.

As for what can be added to this basic program, there's sound, elimination of the wraparound, changing the basic random-pattern movements, etc.

Storing Graphics

One of the problems with programs that create patterns using randomly-located pixels is that, if the program creates a particularly interesting pattern at a particular moment, you can't make the program repeat that pattern.

But there's a way of storing the coordinates of the pixels for "playing back" a particular pattern later. W.A. Fronek, of Houston, TX sent this:

"*Purpose*: At times it is useful to *duplicate*, at a later date, graphics that have been randomly generated or algorithmically generated. This subroutine will *store* the X,Y coordinates of *any lit* graphic block and later, when needed, will duplicate or 'reproduce' these graphics. Duplication is very fast compared to the speed of the original method of generation.

"For example, '3D Plot' (Sept. 1980, p. 186) takes 3 minutes, 15 seconds to generate the entire pattern. This subroutine can 'copy' (re-draw) this pattern in 35 seconds.

"The subroutine can be easily modified for reading/writing the array data to/from disk or cassette.

```
5999 REM SCAN SCREEN - TEST FOR
      GRAPHICS BLOCKS -
      X,Y COORDINATES
      IN ARRAYS X(A) AND Y(B)
6000 DIM X(1000): DIM Y(1000)
6005 A=0: B=0
6010 FOR X=0 TO 127
6020 FOR Y=0 TO 47
6030 IF POINT(X,Y) THEN GOSUB 6060
6040 NEXT: NEXT
6050 GOTO 7000
6060 A=A+1: B=B+1
6070 X(A)=X: Y(B)=Y
6080 M=M+1
6090 RETURN

6999 REM SET GRAPHICS BLOCKS FROM
     COORDINATES TAKEN FROM
     ARRAYS X(C) AND Y(D)

7000 CLS
7010 C=C+1: D=D+1
7020 SET(X(C),Y(D))
7030 IF C=M THEN 7040 ELSE 7010
7040 GOTO 7040
```

"*Function*: Invisibly scans the screen and tests for graphics blocks (6000-6090). Keeps count (6080) of the number of graphics blocks that have been seen by the POINT statement (6030).

"As written, the subroutine will then clear the screen and set graphics blocks using the coordinates 'stored' in the arrays (7000-7040). Line 7030 terminates the loop when the array size equals the number (M) of graphics blocks that were seen by the POINT statement. This will also prevent a Subscript Out Of Range error.

"Arrays must be DIMensioned to cover at least the number of graphics blocks to be scanned."

Storing the Wanderer

As an example of storing graphics, combine Fronek's subroutine with the wandering-pixel program, and add

```
135 B$=INKEY$: IF B$=""
      THEN 140 ELSE 5999
```

If and when the graphics program creates a pattern you want to store, simply press any key, which will call up the storage subroutine. The screen-scan takes just over a minute to scan all 6144 points, so if nothing happens for a while, don't assume the program isn't working.

Fronek's original subroutine didn't contain line 6005. To find out why it's needed, run the program several times without it, and then try to figure out what happened.

TV
SANDY
©CREATIVE COMPUTING

"There's nothing on worth watching tonight. What's on the computer?"

Graphics and Cassette I/O

If you know how to use cassette input/output statements INPUT# and PRINT#, or the corresponding disk statements, and how to keep track of the number of pixels involved, you can try writing the modifications suggested by Fronek.

If you've never used these I/O statements, you may prefer to follow along, with TRS-80 in hand, as we look into them.

Delete line 7040, and change the preceding line to:

```
7030 IF C=M THEN 8000 ELSE 7010
```

and add these lines to Fronek's subroutine:

```
8000 C=1: D=1
8010 PRINT C;X(C);Y(D),
8020 IF C=M THEN 9000
8030 C=C+1: D=D+1: GOTO 8010
```

Line 8000 resets the C and D counters. Line 8010 prints the number and coordinates of each pixel in the displayed figure; this can be eliminated later (along with lines 8020-8030), but is useful at this point to show the contents of the arrays.

Lines 8020 and 8030 keep count of the number of pixels, by comparing array size with M, which was created in 7030. M is important later, when the computer reads the stored pixel coordinates from tape or disk, to signal when the full count has been reached.

But if you try to use M in the read routine, it won't work if you're counting on M to carry over from the write routine. It should work; after all, there's 7030, with C=M. Yet when you later try to use M, something is wrong. If you wonder what happened to the value of M, you might insert a line in your read routine to display it, and you may be surprised to see that it's zero.

How come? M had a non-zero value in 7030, so what happened between then and the RUN of your read routine? The answer is in the RUN. Look it up in your manual, and you'll find something like "Whenever RUN is executed, computer also executes a CLEAR," which resets all numeric variables to zero.

Carry Over The Count

So how do you carry M over the gap between write and read? Probably the easiest way (can you think of any other?) is simply to record it on the tape or disk, ahead of the pixel coordinates.

LISP

for
TRS-80 Models I & III

AND NOW, CP/M*!

SuperSoft LISP allows the TRS-80 to become a complete Artificial Intelligence laboratory! It is the tool that takes you to the frontier of Computer Science.

The SuperSoft LISP is a *complete and full* implementation. (It is NOT a subset!) It contains an efficient garbage collector which optimizes the usage of user RAM, and supports the TRS-80 graphics. Below are some features:

- Runs in 16k level II (with only 6K overhead)
- Fully implements atom property list structure.
- PROG is supported.
- FUNARG device is implemented.
- Efficient garbage collection.
- Complete with LISP editor and trace.
- Allows complete range of single precision numeric data.
- Works with old as well as new ROMs.
- Contains 97 functions.
- Sample Programs.

The LISP package is supplied on tape or discette and with a complete user manual.

cassette version TRS-80: (requires 16K level II)	$75.00
Disk version TRS-80: (requires 16K disk)	$100.00
CP/M version: (requires 32K CP/M)	$150.00

(manual only: $15.00)

Software available for virtually all CP/M systems. Specify your system.

Available from fine dealers everywhere,
or directly from:
SUPERSOFT, INC.
P.O. BOX 1628
CHAMPAIGN, IL 61820
217-359-2112 Telex: 270365
Technical Hot Line: 217-359-2691

VISA

master charge

U K and Europe
DIGITAL DEVICES
134 LONDON ROAD
SOUTHBOROUGH KENT
TUNBRIDGE WELLS
TN4 OPL
ENGLAND
Tel Tunbridge Wells(0892) 37977/9
Telex 95582

ASR CORPORATION INTERNATIONAL
1-2-8, SHIBA-DAIMON
TOKYO 105
JAPAN
Tel (03)-437-3901 Telex 242-3296

SuperSoft

First in Software Technology

TRS-80 TRADEMARK TANDY CORP

*CP/M REGISTERED TRADEMARK DIGITAL RESEARCH

CIRCLE 174 ON READER SERVICE CARD

Save With

"Simply the Best"

Service Technologies

Centronics Printer Sale

Completely Refurbished, 30 Day Warranty

Model #		
101	165 c.p.s., 132 print positions, 5 × 7 dot matrix, areal work horse	only $449.00
101A	Same as above with the added features of 9 × 7 dot matrix and USASCII 95 character	only $549.00
101AL	Added Bells and Whistles. All the features of the 101 line plus LSI	only $749.00
102A	330 c.p.s., 125 L.P.M. bi-directional print 9 × 7 dot matrix	only $949.00
*306	The best of Centronics line at the best price, compact, 120 characters per second, 5 × 7, VFU, top of form and more	only $689.00
	Quietizer covers available for this model only	only $ 89.00
501	120 c.p.s., 30 L.P.M. at 132 character lines, 150 L.P.M. at 30 character lines, 5 × 7 dot matrix, sprocket feed, motor control	only $649.00
503	120 c.p.s., sister to the 501 with bi-directional print at twice the speed	only $749.00

- Print stands available for all models only $ 70.00
- Paper catchers for all models only $18.00

Options

- **Add lower case** to most Centronics Printers **only $89.00**

- **Add Motor Control to your 779 printer only $95.00**

Our Conversion Kit I gives most Centronics printers the ability to print in upper and lower case - $89.00
Our Conversion Kit II turns your motor on and off automatically. Increases the life of your printer $95.00
Both kits require **NO** soldering, etch cuts, software mod. or interface. Easy Installation.

Interfaces

- Now use your Centronics **Parallel Printer on any Computer with a serial Port. Available in four models all with switchable baud rates.**

Model	
CSP - 100 No buffer	only $175.00
CSP - 200 256 char. buffer	only $225.00
CSP - 200X X on/X off Protocol	only $340.00
CSP - 2000 2048 char. buffer	only $395.00

Many More Interfaces Available

To order: Call 603-883-5369

Service Technologies
32 Nightingale Rd.
Nashua, N.H. 03062

master charge

VISA

Visa and Master Charge accepted
Inquiries Always Welcome

Shipping and Handling Extra

CIRCLE 330 ON READER SERVICE CARD

TRS-80,continued...

```
9000 PRINT#-1,M
9010 C=1: D=1
9020 PRINT#-1,X(C),Y(D)
9025 IF C=M THEN 9040
9030 C=C+1: D=D+1: GOTO 9020
9040 STOP
```

Line 9000 stores the M value, and 9020-9030 store the pixel coordinates.

PRINT # takes a long time to store data on cassette: several feet of tape for a few dozen pixels. When they're all recorded, you rewind the cassette to the beginning of the data, and RUN 9050 to read the stored data:

```
9050 C=1: D=1
9052 DIM X(1000): DIM Y(1000)
9055 INPUT#-1,M
9057 PRINT "M =";M
9060 INPUT#-1,X(C),Y(D)
9070 PRINT C;X(C);Y(D),
9075 IF C=M THEN 9090
9080 C=C+1: D=D+1: GOTO 9060
```

Line 9055 picks off the value of M, and line 9057 prints it. Line 9060 reads the pixel coordinates, which are printed by 9070. Lines 9057 and 9070 can be elminated, but are useful here for seeing how the routine works.

If you're wondering why 9052 is necessary, leave it out and see what happens.

Lines 9075 and 9080 use the M value to keep track of the number of pixels involved. When the count reaches M, control moves to 9090:

```
9090 C=1: D=1
9100 SET(X(C),Y(D))
9110 IF C=M THEN 9130
9120 C=C+1: D=D+1: GOTO 9100
9130 END
```

which resets the counters once more, and the subsequent lines re-create the original graphics display from the stored pixel coordinates, again using M to keep track of them.

If you'd like to see the pixels displayed one at a time as they're read from tape or disk, use RUN 10000 (instead of RUN 9050) when the tape has been rewound:

```
10000 CLS
10010 C=1: D=1:
10015 INPUT#-1,M
10020 INPUT#-1,X(C),Y(D)
10025 PRINT @ 0, C;X(C);Y(D)
10030 SET(X(C),Y(D))
10040 IF C=M THEN 10060
10050 C=C+1: D=D+1: GOTO 10020
10060 END
```

Each pixel is displayed to the accompanying faint click of the cassette relay in the computer, because INPUT# turns the tape machine on and off for each pixel coordinate. See the manual for details.

If you have more than a small number of pixels, you'll get a BS error with this routine. Can you figure out what's missing?

Line 10025, which can be eliminated, displays the number and coordinates of each pixel just before it's popped onto the screen. If you want to keep track of how many pixels are in the original, add

```
10017 PRINT @ 0, "M= ";M
```

and change the zero in 10025 to 64, to print on the following CRT line.

Now that you know how the program works, you can delete all the lines that display pixel numbers and coordinates, and rewrite the rest into a tighter and more elegant program.

Blank Program Lines

You probably noticed the blank lines in Fronek's subroutine. They're one of the easiest ways to separate program sections. If you haven't been able to figure out how to create these blank lines, you'll kick yourself when you find out how simple it is. I did.

After you write a program line, don't press ENTER. Space with the right-arrow key until the cursor moves down to the *next* line. Then press either the right-arrow key or the space bar to move the cursor past the first column, and press ENTER.

If you want to add blank lines to a program you've already written, get into EDIT mode, and press X to move the cursor to the end of the line. Then press the space bar (the right-arrow key is inoperative in EDIT mode) until the cursor moves down to the next line, and press ENTER.

That's all there is to it. Just remember to move the cursor past the first column of the second line (reserved for the greater-than sign, unless you're in EDIT mode), and into the line-number columns, or you won't get a blank line.

©CREATIVE COMPUTING
DAVE CARPENTER

"That's right Mildred, Mrs. Jones started stepping out with Mr. Smith on June third."

Try to print this out, and you may be in for a surprise, because your printer may ignore the blank lines and act just as though they weren't there.

No problem: when writing or editing the program, just put *two* blank lines between program lines you want to separate. Both will show up on the screen, but only one will appear on the printer.

When all else fails, you can space between printed lines by manually spacing between LLISTs of groups of lines. It ain't elegant, but it's fast and easy.

Sketch-80

The Sketch-80 program generates screen graphics for the 16K Level-II TRS-80, and can be used with or without a light pen. It's $14.95 on cassette from Quality Software (6660 Reseda Blvd., Suite 105, Reseda, CA 91335).

According to the fairly extensive 12-page manual, Sketch-80 will work with several different light pens, including the QS pen manufactured by Micro Matrix (March 1980, p. 155), which uses the amplifier in your tape recorder and is thus cheaper than most other light pens, which have built-in amplifiers.

Enter the machine-language program, and you get a display of five words across the top of the screen, each with a square to the left of it: WRITE, ERASE, CLEAR, STORE, RECALL.

Point the pen at the square beside WRITE, wait until the square turns into an X, then point the pen elsewhere on the screen. The computer then finds where you're pointing, and turns on a large (3 x 3) rectangle of graphics blocks at that place on the screen.

Move the pen slowly across the screen, and a line of rectangles is lit. To erase the line, or any part of it, you do the same thing, but first get into ERASE mode. To wipe out the display, activate CLEAR.

To store the image you've created, aim at the STORE block, then keyboard a number from 0 to 4. To bring back the image later, use the RECALL block, then hit the same number.

To store the image in reduced size, one-third as large as the original you've created, store it by typing a letter from A to C. (A greater number of images can be stored on 32K or 48K systems.) You can store a reduced image in any one of nine buffers; when the image is recalled it will be displayed in one of nine corresponding sections of the screen: three across the width of the screen, and three down, each 40 x 15 pixels (graphics blocks) in size.

All graphics are constructed in the Enlarged Screen Mode, which "helps the artist see the detail of his work and enables the light pen to work more effectively," the manual says. According to Bob Christiansen of Quality Software, "The TRS-80 video monitor has serious limitations when it comes to the use of a light pen, in the way of flicker, reflection, screen curvature, and distortion. The latter two problems make it difficult for the user to place the pen exactly on a small dot. For this reason we decided on the enlarged screen method of drawing with a light pen. Even this takes some getting used to, but one can develop a skill for it with a little practice."

When you're working with the reduced image, the first two top-of-the-screen words are DUMP and TEXT, rather than WRITE and ERASE. DUMP displays the address and graphics-character codes for your image, which you can use with POKE or CHR$ routines to create the image in Basic.

Using TEXT, you can mix normal-sized text with your graphic image. Images can also be saved on disk or tape.

Sketch-80 is much faster without a light pen, using the keyboard: W for write, E for erase, C for clear, the four arrows for moving the cursor or the entire reduced image, etc. This mode would be even faster if the keys had an auto-repeat feature.

Using letter keys, images can be manipulated so that, using RECALL and letter A, for instance, you can display a single image, or nine of the same image, or nine different images, all at the same time on the screen. This would be one way of creating animation graphics for entering into a Basic program, since you can see up to nine frames at a time (although each frame is no more than 40 x 15 pixels in size).

Many interesting and complex effects can be created by using a combination of the simple commands of Sketch-80.

Short Program #25: 4-Way Random Draw

In looking for a short program to end this column, I found one that I soon realized had been my subconscious inspiration for the wandering-pixel program. Can you figure out why it creates different patterns than the wandering-pixel program?

Gerald Jervis wrote from Chickasha, OK, "Enclosed is a listing which I have written, called Random Draw. It will make random lines which you could call op art. It uses four lines working together and it is always mirror-imaged.

"Oh! A final note: a touch of the spacebar will halt the drawing, wait a few seconds, then CLS and start again."

The CLS is automatic, after a wait caused by the loop in line 170. Delete that line and the restart is immediate. ☐

```
0 ' *************************
1 ' ***   RANDOM DRAWING   ***
2 ' ***        BY         ***
3 ' ***  GERALD K. JERVIS  ***
4 ' ***  CHICKASHA, OKLA.  ***
5 ' *************************
6 '
7 ' ** HIT SPACE BAR  **
8 ' ** TO START AGAIN **
10 CLS: RANDOM
20 M=64: N=24: SET(M,N)
22 X=64: Y=24: SET(X,Y)
25 P=64: O=24: SET(P,O)
27 R=64: S=24: SET(R,S)
30 RANDOM: A=RND(4)
40 FOR B=1 TO RND(5)
50 ON A GOTO 60,80,100,120
60 X=X+1: IF X>127 THEN X=127
65 R=R+1: IF R>127 THEN R=127
70 M=M-1: IF M<1 THEN M=0
75 P=P-1: IF P<1 THEN P=0
77 GOTO 140
80 X=X-1: IF X<1 THEN X=0
85 R=R-1: IF R<1 THEN R=0
90 M=M+1: IF M>127 THEN M=127
95 P=P+1: IF P>127 THEN P=127
97 GOTO 140
100 Y=Y+1: IF Y>47 THEN Y=47
105 S=S-1: IF S<1 THEN S=1
110 N=N-1: IF N<1 THEN N=1
115 O=O+1: IF O>47 THEN O=47
117 GOTO 140
120 Y=Y-1: IF Y<1 THEN Y=1
125 S=S+1: IF S>47 THEN S=47
130 N=N+1: IF N>47 THEN N=47
135 O=O-1: IF O<1 THEN O=1
140 SET(X,Y): SET(M,N)
145 SET(P,O): SET(R,S)
150 X$=INKEY$
155 IF X$=" " THEN 170 ELSE NEXT B
160 GOTO 30
170 FOR C=1 TO 1000: NEXT C
180 GOTO 10
```

RACET SORTS — RACET UTILITIES — RACET computes — RACET SORTS — RACET UTILITIES — RACET computes — RACET SORTS — RACET UTILITIES — RACET computes —

FIELD PROVEN!!
10 MEGABYTES and MORE for the TRS-80* Model II
plus SHARED ACCESS to HARD DISK DRIVE

Hard/Soft Disk System (HSDS) Software allows access as single drive. You can have that 10 Megabyte continuous file - that 50,000 name maillist or inventory! Or a directory with 1000 entries! All completely compatible with TRSDOS 2.0 BASIC. You can mix floppy and hard disk drives. Includes special utilities including HPURGE, DCS Directory Catalog System, HZAP Hard Disk Superzap, and many special formatting options. Three to eight times faster than floppy! RACET quality.

HARD DISK DRIVE & CONTROLLER $5995. Second User $595.
HSDS Software $400. (Note: HSDS now also available for CORVUS drives!!)

INFINITE BASIC (Mod I & III Tape or Disk) **Mod I $50.00, Mod III $60.00**
Extends Level II BASIC with complete MATRIX functions and 50 more string functions. Includes RACET machine language sorts! Sort 1000 elements in 9 seconds!! Select only functions you want to optimize memory usage.

INFINITE BUSINESS (Requires Infinite BASIC) **Mod I & III $30.00**
Complete printer pagination controls — auto headers, footers, page numbers. Packed decimal arithmetic — 127 digit accuracy +, −, *, /. Binary search of sorted and unsorted arrays. Hash codes.

BASIC CROSS REFERENCE UTILITY (Mod II 64K) **$50.00**
SEEK and FIND functions for Variables, Line Numbers, Strings, Keywords. 'All' options available for line numbers and variables. Load from BASIC — Call with 'CTRL'R. Output to screen or printer!

DSM **Mod I $75.00, Mod II $150.00, Mod III $90.00**
Disk Sort/Merge for RANDOM files. All machine language stand-alone package for sorting speed. Establish sort specification in simple BASIC command File. Execute from DOS. Only operator action to sort is to change diskettes when requested! Handles multiple diskette files! Super fast sort times — improved disk I/O times make this the fastest Disk Sort/Merge available on your TRS.
(Mod I Min 32K 2-drive system. Mod II 64K 1-drive. Mod III 32K 1-drive)

GSF (Mod I & III Tape or Disk - Specify Memory Size)
Mod I $25; Mod II $50; Mod III $30
Generalized Subroutine Facilities. The STANDARD against which all other sorts are compared! And then compare prices! Machine language — fast and powerful! Multi-key multi-variable and multi-key character string. Zero and move arrays. Mod II includes USR PEEKS and POKES. Includes sample programs.

DISCAT (32K 1-drive Min) **Mod I, III $50.00**
This comprehensive Diskette Cataloguing/Indexing utility allows the user to keep track of thousands of programs in a categorized library. Machine language program works with all TRSDOS and NEWDOS versions. Files include program names and extensions, program length, diskette numbers, front and back, and diskette free space.

KFS-80 (1-drive 32K Min — Mod II 64K) **Mod I, III $100.00; Mod II $175.00**
The keyed file system provides keyed and sequential access to multiple files. Provides the programmer with a powerful disk handling facility for development of data base applications. Binary tree index system provides rapid access to file records.

MAILIS [illegible] **od II $150.00**
This ISA [illegible] — no separate sorting. [illegible] orts 9-digit zip code and 3-dig [illegible] ributes. Mask and quer [illegible] ection. Record access times under 4 [illegible]

COMPRO [illegible] od I & Mod III — Disk only) [illegible]
Comman [illegible] ocessor. Auto your disk to [illegible] structions that you can [illegible] from the keyboard. DIR, FREE [illegible] ut, BASIC, No. of FILES [illegible] MEM SIZE, RUN program [illegible] ents, BREAK, return to [illegible] etc. Includes lowercase dr [illegible] d screenprint!

UTILITY [illegible] **$150.00**
Important e [illegible] alone will pay for the pac [illegible] page manual! XHIT, XGAT [illegible] and SUPERZAP are used [illegible] cover date from bad diskett [illegible] rovides multi-file [illegible] select, absolute sector mod [illegible] any sector on diskette include track 0 [illegible] recovery. DCS builds co [illegible] gle display or listing sorted by disk name or file name plus more. Change Disk ID with DISKID. XCREATE preallocates files and sets 'LOF' to end to speed disk accesses. DEBUGII adds single step, trace, subroutine calling, program looping, dynamic disassembly and more!!

DEVELOPMENT PACKAGE (Mod II 64K) **$125.00**
Includes RACET machine language SUPERZAP, Apparat Disassembler, and Model II interface to the Microsoft 'Editor Assembler Plus' software package including uploading services and patches for Disk I/O.

CHECK, VISA, M/C, C.O.D., PURCHASE ORDER
TELEPHONE ORDERS ACCEPTED (714) 997-4950

*TRS-80 IS A REGISTERED TRADEMARK
OF TANDY CORPORATION

RACET COMPUTES
1330 N. GLASSELL, SUITE M,
ORANGE, CA 92667

RACET SORTS — RACET UTILITIES — RACET computes — RACET SORTS — RACET UTILITIES — RACET computes — RACET SORTS — RACET UTILITIES — RACET computes —

RACET SORTS — RACET UTILITIES — RACET computes — RACET SORTS — RACET UTILITIES — RACET computes — RACET

RACET SORTS — RACET UTILITIES — RACET computes — RACET SORTS — RACET UTILITIES — RACET computes — RA

CIRCLE 205 ON READER SERVICE CARD

...intelligent computer games...

David Levy

Correspondence is welcome. Letters with interesting questions and ideas will be used in the column along with a response. No personal replies can be made. Send to: David Levy, 104 Hamilton Terrace, London NW8 9UP, England.

SHOGI

This month I wish to introduce readers to a game which they will almost certainly never have come across. It is related to chess, but has an added dimension of complexity which can result in exciting sequences being sustained for very many more moves than in chess. This game is so popular in its country of origin (there are some 19 million players) that those who excel at the game often become millionaires, and are held in greater esteem than Bjorn Borg in Sweden or Kevin Keegan in England. I am referring to shogi, or Japanese chess, and I can recommend the game very highly to anyone who enjoys 'western' chess. My shogi-playing friends have been trying to persuade me for some time that 'western' chess is an inferior form of the game and, although I have yet to be firmly convinced by their arguments, I must confess that shogi does have enormous appeal. Since it is well known that computer programmers usually show great aptitude for chess, it is likely that among the readers of this magazine there are many potential shogi masters (or dans as they are known in Japan), and many thousands who would enjoy the game if they took an hour or so to learn how to play it.

Japan is the Mecca of shogi, but during the past few years an organisation has grown up in the western world whose aim is to popularise the game outside its native country. The Shogi Association, PO Box 77, Bromley, Kent, England welcomes new members and will supply shogi sets and elementary literature to those who cannot find them elsewhere. It also publishes a regular magazine and holds meetings in London. Through the efforts of the Shogi Association there have been shogi tournaments held in London, for which leading Japanese players have flown half way round the globe, and in last year's tournament I was able to see my colleague Larry Kaufman, an International Chess Master from the USA who seems to have abandoned the 'inferior' form of the game for its Japanese counterpart. I understand that he has now become completely addicted, to the extent of travelling to Japan in the hope of becoming a professional shogi player.

How to Play Shogi

The best way to learn the game of shogi is to buy a copy of *How to Play Shogi* by John Fairbairn, and to study this slim volume with a shogi set in front of you. Although shogi sets normally have the pieces inscribed in Japanese characters, the Shogi Association imports sets in which the pieces also have westernised lettering as well as arrows to show you how each of them moves. It should take no longer to learn the moves at shogi than to learn how to play western chess, and I am reliably informed that one can even get used to the Japanese symbols rather more quickly than one might suspect. Since the main point of this article is to enable the reader to write his own shogi-playing program, I must begin with a precis of the rules and moves of the game.

Each player starts the game with 20 pieces made of wood or plastic. These pieces are uniform in colour, but for the sake of convenience we call them Black and White, as in chess. The game is played on a 9 x 9 board (does anyone know of a 9-bit processor?) with the two armies set up in the following starting position:

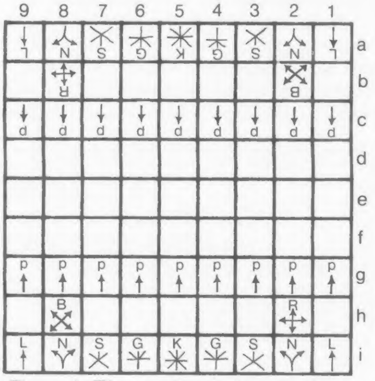


Figure 1. The starting position in shogi.

The Pieces and Their Moves

KING: Each player has one king and, as in chess, the object of the game is to checkmate the opposing king. As in chess the king can move one square in any direction (horizontal, vertical or diagonal).

GOLD GENERAL: At the start of a game each player has two golds. The gold moves one square at a time, vertically, horizontally, or diagonally forwards. It may not move diagonally backwards.

SILVER GENERAL: Each player has two silvers. The silver moves one square at a time, diagonally or forwards. It may not move sideways and it may not move straight backwards.

KNIGHT: Each player has two knights, whose move has the same form as the knight in chess but with the restriction that it may only move two squares forwards and then one square to the left or right. So whereas a chess knight has

Your prayers have been answered.

If you own or use a micro-computer, then chances are that from time to time, you've wished that someone could simplify programming.

Because as useful as micro-computers are, they can only ever be as good as the programs they run.

Well then, how does this sound?

No more program-coding. No more debugging. And no more time wasting.

Arguably more comprehensive and advanced than anything else of its kind, The Last One is a computer program that writes computer programs. Programs that work first time, every time.

By asking you questions in plain English about what you want your program to do, The Last One uses your answers to generate a ready-to-use program in BASIC.

What's more, with The Last One, you can change or modify your program as often as you wish. Without effort, fuss or any additional cost. So as your requirements change, your programs can too.

And if, because of the difficulties and costs of buying, writing and customising software, you've put off purchasing a computer system up to now, you need delay no longer.

Available now.

The Last One costs $600 plus local taxes where applicable and is now available from better computer stores.

For further information, write to D.J. 'AI' Systems Ltd.,
Two Century Plaza, Suite 480,
2049 Century Park East,
Los Angeles, CA 90067.
Tel: (213) 203 0851.

THE LAST ONE™

CIRCLE 343 ON READER SERVICE CARD

eight moves at its disposal from a central square on an empty board, a shogi knight will have only two possible moves, but as in chess it may jump.

LANCE: Each of the two lances moves straight forwards as far as it likes, but it may not jump.

ROOK: The shogi rook moves exactly like its counterpart in western chess, in a straight line as many squares as it wishes. There is no queen in shogi, so the rook is usually regarded as the most powerful piece.

BISHOP: Again this piece moves just like a chess bishop — any number of squares in a diagonal direction.

PAWN: As in chess, the initial shogi position has a row of pawns across the board. Since shogi is played on a 9 x 9 board, each player begins the game with nine pawns, which can move one square forwards. There is no double pawn move when a pawn makes its first move; there is no diagonal capturing move; and there is no such thing as an en passant capture.

Promoted Pieces

One of the most interesting aspects of shogi, as compared to chess, is the fact that whereas in chess only the pawns can promote to a piece of higher value, in shogi some of the other pieces can also promote. A promotion move is made by moving a piece partly or wholly within your promotion zone (the last three ranks or rows furthest from you). Promotion takes place at the conclusion of the promoting move, and it is important to remember that in shogi it is not always compulsory to promote, as we shall see. The following pieces have the ability to promote:

SILVER: The promoted silver moves exactly like a gold. On your shogi set the silver can be turned over and on the reverse side you will see the symbol for a promoted silver.

KNIGHT: The promoted knight also moves exactly like a gold.

LANCE: The promoted lance moves exactly like a gold.

PAWN: The promoted pawn moves exactly like a gold.

ROOK: When the rook is promoted it retains its original ability to move any number of squares horizontally or vertically, and acquires the extra ability to move one square in a diagonal direction.

BISHOP: Similarly, when the bishop is promoted, its original move is retained and it has the new ability to move one square vertically or horizontally.

If a pawn or lance moves to the last rank, or if a knight moves to either of the last two ranks, promotion is compulsory. At all other times, promotion is optional.

Capturing

If a player moves one of his pieces onto a square that is occupied by one of his opponent's men, the opponent's piece is captured as in chess. But here lies one essential difference between the two games, and it is this difference that adds an extra dimension to the game of shogi.

In chess, when you capture one of your opponent's pieces it is removed from the board forever. In shogi you keep this piece 'in hand', and later in the game you may drop it onto any vacant square (subject to a few restrictions). The drop is made instead of moving a piece from one square to another, and it is important to remember that a piece may only be dropped in its unpromoted state, even if it had been promoted before it was captured. When you drop a captured piece onto the board it becomes your own piece, and for this reason the capture of an enemy piece has a double significance. One interesting aspect of the drop is the fact that you might well decide to sacrifice a valuable piece on one part of the board in return for an inferior one, simply because you want to be able to drop that inferior piece on another part of the board within the next few moves.

Check and Checkmate

When a king is attacked it is said to be in check, just as in chess, and the player who is in check must take evasive action immediately — moving his own king, capturing the checking piece, or interposing a piece between the two. If the king is attacked and there is no way to save it, the player has been checkmated. Since all of the pieces are, in practical terms, in play throughout the game, it is extremely rare for a game of shogi to end in a draw. In chess the number of the pieces on the board is gradually reduced as the game progresses, and when sufficient reduction has taken place the game will inevitably end in a draw. Those who find master chess games boring because too many of them (some 55 percent or more) are drawn, need have no such fear regarding shogi.

How to Program Shogi

There is no reason why most of the principles that apply to chess programming cannot also be applied to shogi programming. Growing and searching a game tree is the obvious approach, the most serious problem being the large branching factor caused by the increased number of pieces (40 instead of a maximum of 32) and the possibility of the drop. If you hold just one type of captured piece 'in hand' you will have 42 or more squares on which it may be dropped. It is easy to see how the number of legal moves at one's disposal can easily increase to 150 or 200, once two or three enemy pieces have been captured. Clearly it is necessary to find some way of reducing the list of legal moves to produce a list of plausible moves which is of manageable size. The answer to this problem lies in the use of intelligent shogi heuristics, or 'proverbs' as they are known in the trade.

Anyone who is interested in writing a chess program need only refer to the enormous wealth of chess literature in order to find a number of heuristics which can be employed in a plausible move generator or an evaluation mechanism. A lot has also been written about shogi, but unfortunately for most readers of this article it is almost entirely published in Japanese, and if your Japanese is anywhere near as bad as mine is you will not relish the thought of ploughing through tomes of mysterious symbols. Here I have space for only a very small number of heuristics, and I must recommend the reader to take a look at the extensive list which can be found at the back of Fairbairn's booklet. In addition, those of you who would like to make your shogi programs as strong as possible ought to join the Shogi Association and try to obtain all the back numbers of *Shogi* magazine *(issue 1 is sold out — Ed.)*, in which the most important proverbs are explained. Once you understand a proverb, it is an easy matter to convert it to numerical form so that it can form part of the evaluation/plausibility mechanism.

Shogi Openings

The exact order in which the opening moves are played does not appear to be so critical in shogi as it is in chess. The most important aspect of opening play in shogi seems to be the squares on which one places one's pieces, and not the exact order in which they are moved there. The only source of shogi openings that I can find in any language other than Japanese is, once again, that published by the Shogi Association.

Since it is not necessary for your shogi program to have access to large tables of opening variations, you need only devise some method of encouraging the program to make moves that will lead to its pieces being on the right squares. A simple method of accomplishing this is to examine each of the pieces in a desired formation and

SAVE $$ **DISCOUNT PRICES** SAVE $$

apple computer

16K APPLE II	1049.00
32K APPLE II	1074.00
48K APPLE II	1099.00
DISK W/CONTROLLER	499.00
DISK ONLY	445.00
APPLESOFT CARD	139.00
INTEGER CARD	139.00
PASCAL SYSTEM	399.00
SILENTYPE PRINTER	349.00
HAYES MICROMODEM	295.00
Z-80 SOFTCARD	295.00
VIDEX 80 COL. BRD.	295.00
16K RAM BOARD	169.00

RAM MEMORY

FOR TRS-80, APPLE II	
16K SET 4116's (200 NS)	24.95

ATARI

400 16K	349.00
800 16K	759.00
410 Recorder	64.00
815 Disk	1199.00
810 Disk	489.00
822 Printer	359.00
825 Printer	779.00
830 Modem	159.00
850 Interface Module	179.00
CX853 RAM	85.00
CX70 Light Pen	64.00
CX30 Paddle	18.00
CX40 Joystick	18.00

VERBATIM DISKETTES

Box of 10 5¼"	29.50
Box of 10 8"	39.50

North Star Computers

HR2-2D-32K	2795.00
HR2-20-48K	2956.00
HR2-2D-64K	3145.00
HR2-2Q-32K	2975.00
HR2-2Q-48K	3165.00
HR2-2Q-64K	3360.00
HRAM 32K	469.00
HRAM 48K	662.00
HRAM 64K	849.00
HDS-18 HARD DISK	4025.00
MDS-DRV-D	495.00
MDS-DRV-Q	665.00
ADC-1-D	740.00
ADC-2-D	995.00
ADC-1-Q	795.00
ADC-2-Q	1285.00

PRINTERS

EPSON MX-70	399.00
EPSON MX-80	499.00
EPSON MX-80 FT	599.00
GRAFTRAX	90.00
INTERFACE (APPLE)	75.00
CABLE	22.50
CENTRONICS 737-1	795.00
CENTRONICS 737-3	855.00
IDS 445G	815.00
IDS 460G	1195.00
IDS 560G	1450.00
NEC 5510 W/TRACTORS	2650.00
NEC 5520 KSR W/TRAC.	2995.00
QUME 5/45 SPRINT	2675.00
FORMS TRACTOR	195.00
STARWRITER W/TRAC.	1695.00
STARWRITER W/O TRACTOR	1500.00

General Information:

We carry a large selection of hardware and software by other companies. Send for our catalog.

We are an authorized repair center for **APPLE, ATARI, NORTH STAR, AND EPSON.**

PRICES SUBJECT TO CHANGE WITHOUT NOTICE. MARYLAND RESIDENTS ADD 5% SALES TAX

FREDERICK COMPUTER PRODUCTS, INC.

5726 INDUSTRY LANE
FREDERICK, MD. 21701

Store Hours:
MON. THRU THURS. 9:30 AM—9:00 PM
FRI. AND SAT. 9:30 AM—5:00 PM

TO ORDER CALL: (301) 694-8884

CIRCLE 178 ON READER SERVICE CARD

PRICE BREAKTHROUGH
16K RAM BOARDS FOR APPLE JUST $129.95

HAVE YOU BEEN WAITING FOR THE COST OF EXPANSION BOARDS TO COME DOWN? YOUR WAIT IS OVER. UP UNTIL NOW RAM EXPANSION HAS COST AS MUCH AS $195.00. NOW **OMEGA MICROWARE** IS PROUD TO ANNOUNCE THE ARRIVAL OF A TRULY AFFORDABLE EXPANSION CARD.

NOW YOU CAN RUN **PASCAL, FORTRAN, 56K CPM** WITH **A Z80 SOFTCARD, INTEGER BASIC, APPLESOFT AND OTHER LANGUAGES** ON YOUR **APPLE**. NOW YOU CAN **INCREASE USUABLE MEMORY** FOR **VISICALC**. NOW YOU DON'T HAVE TO PAY A FORTUNE TO HAVE ALL THIS.

AT $129.95, **OMEGAS RAMEX 16** IS THE LOWEST PRICED CARD AVAILABLE TODAY.

WHAT DO YOU GIVE UP WHEN YOU PURCHASE THIS FIRST REALLY AFFORDABLE **RAM** EXPANSION CARD? WELL, YOU GIVE UP HAVING TO REMOVE ONE RAM CHIP FROM THE MOTHER BOARD OF YOUR **APPLE**. YOU GIVE UP HAVING TO STRAP A CABLE FROM THE CARD TO YOUR MOTHER BOARD. THAT'S IT. WHAT YOU GET IS A SIMPLE, RELIABLE, BOARD THAT JUST PLUGS IN. MEMORY REFRESH IS ACCOMPLISHED ON THE BOARD ITSELF.

THE **RAMEX 16** IS GUARANTEED NOT JUST FOR 90 DAYS. NOT EVEN 6 MONTHS. OUR **WARRANTY** IS FOR **ONE FULL YEAR** FROM DATE OF PURCHASE. WE WILL REPAIR OR REPLACE ANY BOARD THAT IS DEFECTIVE THROUGH MANUFACTURE FOR A PERIOD OF ONE YEAR AFTER PURCHASE PROVIDED THIS DAMAGE IS NOT USER INFLICTED.

ORDER YOUR **RAMEX 16** NOW BY CALLING **TOLL FREE** 1-800-835-2246. **KANSAS RESIDENTS CALL** 1-800-362-2421. MASTERCARD OR VISA ACCEPTED OR SEND $129.95. ILLINOIS RESIDENTS ADD $7.80 SALES TAX.

ANOTHER QUALITY PRODUCT FROM
OMEGA MICROWARE, INC.
FORMERLY OMEGA SOFTWARE PRODUCTS, INC.
222 SO. RIVERSIDE PLAZA
CHICAGO, IL 60606
PHONE 312-648-1944

©OMEGA MICROWARE, INC.

APPLE AND APPLESOFT ARE REGISTERED TRADEMARKS OF APPLE COMPUTER, INC. PASCAL IS A REGISTERED TRADEMARK OF THE REGENTS OF THE UNIV. OF CA. SAN DIEGO. VISICALC IS A REGISTERED TRADEMARK OF PERSONAL SOFTWARE. CPM IS A REGISTERED TRADEMARK OF DIGITAL RESEARCH INC. Z80 IS A REGISTERED TRADMARK OF ZILOG, INC. SOFTCARD IS A REGISTERED TRADMARK OF MICROSOFT.

CIRCLE 200 ON READER SERVICE CARD

determine how many moves away from its target square it is at the moment. The 'opening' feature in the evaluation function can then be penalised by (say) 1 point for each piece that is one move away from its target square, 2 points for each piece that is two moves away, and so on. This method, or any similar pattern-matching process, will provide a useful measure as to the degree to which a desired opening formation has been achieved.

The Middle Game—a Few Heuristics

As in chess, the middle game in shogi sees most of the manoeuvring and struggling for a strategic advantage. This is the part of the game for which an evaluation function will be of the greatest use. The players must fight for control of important squares, and in particular for control of the area near their opponent's king. In shogi the initiative is just as important as it is in chess, and by building up a strong attack in the area near the enemy king, a player may develop an initiative which can later be converted into a win. Many of the heuristics that you will find in *Shogi* magazine will relate to the initiative and to the concepts of king attack and king safety.

Perhaps the most difficult problem that you will encounter when writing a shogi program is that nobody has written one before you, so there is absolutely no published literature on the subject. In order to convert a shogi heuristic into a feature for your evaluation function you will therefore be compelled to make various guesses and estimates, and then improve the weightings of your function in the light of experience.

Possibly the most surprising aspect of shogi heuristics is the fact that there is no recognised scale of values for the pieces themselves. Almost every schoolboy knows that in chess a bishop or knight is worth roughly three pawns, a rook five pawns, and a queen nine pawns, but to the best of my knowledge there is nothing reliable in the shogi literature to compare. (Readers should be warned that in one book, published in English, the rook is said to be more valuable than the king ignore this book and, probably, anything else not published by the Shogi Association.)

Those of you who have read my articles on chess will know that the second most important feature, after material, is mobility. In fact the chess pieces have material values which are not entirely disproportionate to their average mobilities, so it would be possible to write a chess program that was governed by present and potential mobility, rather than by material and present mobility. In shogi, since material values cannot be defined in the same way as they can in chess, mobility is possibly the most important feature. We define mobility in shogi in the same way as we do in chess — the number of squares attacked by a piece.

The attack on the enemy king is of greater importance in shogi than it is in chess. For this reason, two features which are employed in many chess programs are absolutely vital in a shogi program: King Attack and King Safety. A primitive measure for King Attack is found by adding 2 points for every attack on a square which is not more than three squares distant from the enemy king, and 1 point for every possible move to a square from which such an attack can be made. The sum of these attacks and potential attacks provides a measure of the extent to which a player's pieces can operate within the vicinity of the enemy king, and the extent to which they control possible flight squares that might be used by the enemy king to escape from a strong attack.

King Safety can best be measured by taking into account the number, nature and proximity of friendly pieces that are situated near the king. If your king is surrounded by many of its own pieces it will be much safer from attack than if it is in an exposed part of the board, with few of its own pieces nearby. As in chess, it often pays in shogi to keep the pawns in front of your own king as defensive pieces, obstructing the attack of the advancing enemy. In addition, it is useful to have two or three generals (golds and silvers) near your king for added protection. The different shogi openings usually define a particular defensive formation for the king, so by reading about the openings you will learn the various defensive formations and you can design a feature for your evaluation function based on giving bonus points for having your own king well protected by the correct piece.

Gaining material in a game of shogi is useful for two reasons, and some method must be found to reflect this fact in your evaluation function. When you capture an enemy piece you deprive his king of a certain measure of protection if the captured piece was near to the king this protection will be much greater than if the piece was many squares away from the king. You also have an extra piece 'in hand' which may be used later in the game to achieve some strategic aim or to expose the enemy king still further during the blistering attack which you launch prior to checkmate. One way in which your program can measure the value of a captured piece lies in the loss of mobility experienced by your opponent when you capture one of his pieces. Another way is simply to add a certain number of points for every piece that you hold in hand.

So far, we have discussed only a very small proportion of the total number of shogi principles, but these are among the most important. A computer program which takes into consideration mobility, king attack, king safety and the number of pieces held 'in hand' would be able to play a game better than the novice who has just learned the rules of the game. One very important aspect of shogi is the mating attack, and this is one area in which your program will be able to play better than many humans, because it requires pure calculation.

The Mating Attack

In shogi there is no endgame in the same sense as there is in chess. Because captured pieces can reappear on the board, it is rare for a shogi game to end when the board is almost completely devoid of material. To win at shogi you must launch a successful mating attack. We have already discussed two of the evaluation features which can help a program set up and develop an attack against the enemy king. The tactical phase that ends the game will often contain a long, forcing sequence of moves that is difficult for many human players to spot. A computer program should have no such problems, provided that it is looking along the correct path of the tree.

The answer lies in knowing when to search for a mating continuation, and in ignoring all other factors when looking for a mate. It is normally sufficient to have four of your own pieces attacking the enemy king area, so your mating routine can be triggered by a test which counts the number of your own pieces which impinge on any of the squares which are within (say) three squares of the enemy king. If this test provides a positive result, the program can then look along all variations in which its own moves are checking moves. During this phase of the game all other moves may be ignored, on the assumption that if he is given a single move's respite, your opponent will be able to bring another piece to the defence of his king, or will move his king to a safer square. The routine which searches for mate should therefore be single-minded, and by ignoring all moves other than checks it ought to be able to search 7 or 9-ply deep, or even further. If no mate is found within some predetermined horizon, the program simply reverts to the middle-game search algorithm and looks for a move which improves its strategic control of the position.

NorthStar ™

HORIZON II COMPUTERS

Shop around find your best price then call us **COLLECT*** we'll match the price plus ship it direct to you by **AIR**

ABSOLUTELY FREE!*

WORRY FREE WARRANTY - This is our third year with North Star with a reputation of only the finest service (call North Star for a reference) all repairs are handled through our store service center.

CONTINENTAL U.S. ONLY

**LONG ISLAND
COMPUTER GENERAL STORE**
103 ATLANTIC AVE. LYNBROOK NEW YORK 11563
(516) 887-1500

CIRCLE 206 ON READER SERVICE CARD

SHOP 'n SAVE at

MANNFRED *EVERYBODY ELSE DOES!*

ok MACHINE & TOOL

Digital Logic Probe	#PRB-1	$33.25
Dip IC Insertion Tools With Pin Straightener		
14-16 Pin Dip IC Inserter	#INS-1416	3.14
Wire Dispenser — Blue, Yellow, White or Red	#WD-30	4.45
Tri-Color Dispenser	#WD-30-TRI	7.15
Tri-Color Dispenser Replacement Rolls	#R-30-TRI	5.35
Wire Dispenser Replacement Rolls - Blue, Yellow, White, or Red	#R-30-0050	2.68

HOBBY-BLOX

Basic Integrated Circuit Starter Pack	#490	$5.37
Basic Discrete Component Starter Pack	#480	5.91
Blank Panel Pack	#550	1.52
Control Panel Pack	#545	1.52
Distribution Strips	#510	1.79
Discrete Component Strip	#515	2.69
Tray Extender Clips	#570	1.16
Bus Strip	#520	2.69
3x16 Terminal Strip	#525	2.69
Binding Post Strip	#560	3.23
Terminal Strip Pack	#505	2.69

EICO AUTOSOUND PRODUCTS

Cassette Stereo Tape Player & Pushbutton AM/FM Stereo Radio	#C-220	$56.95
Cassette Stereo Tape Player & AM/FM Stereo Radio	#C-230	42.95
Auto-Reverse Cassette Stereo Tape Player & AM/FM Stereo Radio	#C-225	65.95
8-Track Stereo Tape Player & AM/FM Stereo Radio	#C-250	45.95
Teknika Wireless Remote Control	#6301	119.95

VIDEO TAPES

• AMPEX • SONY • ZENITH • JVC

L250	2 for	$18.00
L500	2 for	21.50
L750	2 for	27.50
L830	2 for	28.90
T-120	2 for	28.00

NIGHT SENTRY
SOLID STATE **TIMER**
$19.95 3 @ $15 ea.

TEL/ANSWER/MACHINES
RECORD-A- CALL

#60	Remote #80
$114.95	214.95

BECKMAN DIGITAL MULTI-METERS

0.5% Accuracy	#300	$102.00
0.25% Accuracy	#310	123.25
0.1% Accuracy	#330	186.15

**Ademco Burglar & Fire Alarm Supplies...
Now at Rock-Bottom Prices!**

**Warner Communications Pre-Recorded
First Line Movies** *WRITE FOR OUR CATALOG – THE PRICE IS RIGHT!*

CALL FOR SPECIAL DAY-TO-DAY QUOTES ON ENTIRE LINE OF
COMMODORE & ATARI COMPUTERS
WE SHIP BY U.P.S. - C.O.D., CASH OR CERTIFIED CHECK

MANNFRED ELECTRONICS CORP.
60-10 KISSENA BLVD., FLUSHING, N.Y. 11355
TOLL FREE (800) 221-0466 HOURS 9AM - 4PM E.S.T.

CIRCLE 207 ON READER SERVICE CARD

Now contractors can have the bottom line on every job at their fingertips

This Contractor's Job Cost Program Series was developed and perfected by a contractor with over 15 years experience in all levels of the construction industry —

The program is specifically designed to work flexibly with any construction project, job costing project or departmental accounting.

Job Cost Ledger

- Automatically posts income and expense for each job.
- Gives listing for budgeted expense and income.
- Compares budget amount to actual expense.
- Provides percentage differential between budget amount and actual expense.
- Calls out problem areas with a special "arrowhead."

Job Cost Ledger Detail

Automatically produces a detailed listing of all activity on job/job items:

- Improves the contractor's ability to estimate a job.
- Aids in making on-the-job decisions by having up-to-date cost information.
- Lists amounts paid to subcontractors.

Financial Statements

To obtain a complete set of financial statements, the Contractor's Job Cost Program generates an in-depth, up-to-date report in less than an hour instead of days needed using a manual system. This saves time... and time is money for contractors.

Series I	$1195.00
Series II	$1795.00

For the Apple II+ with 48K memory.

KBS

KLEINHAMMER **BUSINESS SOFTWARE**
P.O. Box 1065, Morro Bay, CA 93442 805/772-2766
Apple is a trademark of Apple Computer, Inc.

CIRCLE 293 ON READER SERVICE CARD

Best prices anywhere
We beat 'em all!

COMPUTERS

NorthStar

Horizon 2-48K DD	CALL
Horizon 2-64K DD, List $4195	CALL
Horizon 2-64K QD, List $4495	CALL
Advantage 2Q-64K, List $3999	CALL
Intersystem DP-2A, List $1749	CALL
Cromemco Z-2H, List $9995	**$7945**
System 2, 64K List $4695	**$3549**
System 3, 64K List $7995	**$5995**

Intertec SuperBrain SPECIALS

64K Ram, List $3495	**$2595**
64K Quad, List $3995	**$2995**

Disk Systems

Thinker Toys, Discus 2D	**$ 849**
Dual Discus 2D	**$1389**
Discus 2+2	**$1199**
M-26	**$3599**
M-10	**$2995**

Printers & Terminals

Paper Tiger IDS-445G	**$ 739**
460G	**$ 839**
Centronics 730-1, List $795	**$ 549**
739-1, List $995	**$ 749**
704-9 Ser	**$1519**
704-11 parallel	**$1569**
TI810, List $1649	**$1289**
Nec Spinwriter 7730	**$2395**
7715	**$2395**
7710	**$2395**
Diablo 630, List $2711	**$2399**
Intertube III, List $895	**$ 725**
Zenith Z-19	**$ 719**
Televideo 910C	**$ 579**
912C	**$ 679**
920C	**$ 779**
950C	**$ 979**
Hazeltine Espirit	**$ 589**
1420	**$ 789**
1500	**$ 845**
Soroc IQ120, List $995	**$ 689**
IQ130	**$ 579**
IQ135	**$ 719**
IQ140	**$ 995**

Computers Wholesale
P.O. Box 144 Camillus, N.Y. 13031
Our order line is
(800) 448-5715
For other information call:
(315) 472-2582

Most items in stock for immediate delivery. Factory sealed cartons, w/full factory warranty. NYS residents add appropriate sales tax. Prices do not include shipping. VISA and Master Charge add 3%. C.O.D. orders require 25% deposit. Prices subject to change without notice.

CIRCLE 130 ON READER SERVICE CARD

How to Deal with Drops

As I mentioned earlier, one of the most serious problems in writing a strong shogi program is the very large branching factor caused by being able to drop a captured piece onto almost any vacant square on the board. (In fact you may drop onto any vacant square provided that (a) you are not dropping a pawn, lance or knight onto a square from which it will never be able to move; (b) you will not have two unpromoted pawns on the same file at the same time; and (c) you do not drop a pawn in such a way as to give checkmate on the move.) How can we reduce the branching factor without ignoring most of the better drops?

The answer lies in identifying a number of key vacant squares (say ten) and examining drops only onto those key squares. This can be accomplished by using the evaluation function to measure the improvement in score that could be achieved by dropping a hypothetical piece (a 'genie') onto each vacant square. The genie has the power of all the other pieces combined, and by estimating its effect on the mobility, king safety, king attack and other features of the evaluation function, when placed on each of the vacant squares, it is possible to produce a ranking order for the vacant squares which indicates which squares are the best candidates for drops. By reducing the number of such squares from (at least) 42 to ten, we can reduce the total number of moves which the program needs to consider. This is especially important when more than one type of piece is to be held in hand.

If a Shogi-playing Program is Too Difficult

It is, perhaps, daunting enough to the reader for me to suggest that you learn a new game as complex as shogi without my adding to this suggestion with the thought that you should also write a shogi-playing program. You may feel that the game itself requires enough of your time, and that a shogi-playing program might be beyond you, especially in view of the paucity of literature on shogi heuristics. In that case, there is still one programming exercise which you will definitely find worth your while, as it will test your understanding of many of the tree-searching ideas that we have discussed in this series of articles, and it will stretch your ability to write code that executes efficiently.

Just as there are many people who are interested in chess problems ('White to Play and Mate in two Moves'), so there is even greater interest in shogi problems. An extremely interesting programming exercise can be found in writing a program which will search for checkmates. In the composition of a chess problem it is part of the composer's task that he must not allow a checking move to be the key to the solution. In shogi, the opposite is true all moves in a shogi problem must be checks or replies to check.

A program which solves shogi problems must therefore employ an efficient test to determine whether or not a move is legal (ie, whether a reply to check achieves the aim of moving out of check), and whether or not a move gives check. These two tests are sufficient, since a move which fails both tests is inadmissable in the tree search. Your problem-solving program has only a very small number of branches at each node, and so a deep search is possible without the program consuming enormous amounts of time. There is not too much scope within a problem-solving program for speeding up the search without the use of heuristics, but one or two notions do suggest themselves. Prefer a checking move that is near to the enemy king to one which is further away (reason -- a far away move allows more interposing possibilities). Prefer a 'safe' checking move to a move which allows the free capture of material (reason — with more pieces of your own side on the board, you have greater chances of forcing mate). Prefer to evade check by moving the king than by interposing a piece (reason -- an interposing move may allow a free capture). Prefer to evade check by capturing the checking piece than by moving the king (reason the less material your opponent has on the board, the harder it will be for him to force checkmate).

Of course, these rules of thumb all have very many exceptions, but other things being equal (which they never are) all of them have some value in ordering the search. □

Bibliography

Fairbairn, J: *How to Play Shogi.*
Shogi Association: *Shogi* (magazine).

The reader is strongly warned against all other shogi literature published in any language other than Japanese. Up to the time of writing this article (May 1981) no other accurate literature is known, and errors in the rules and the moves of the pieces abound.

DIGI-KEY CORPORATION 800-346-5144

In Mn., Ak., Hi. Call 218-681-6674

VISA

Capacitors•Real-Time Clock/Calendar• E F Johnson •Termin
AP Products•Batteries•ZNR's•Books•Zenier Diodes•Breadbc
•Enclosures•Resistors & Resistor Networks•Hardware•Powe
Microprocessor & Support•Luxo Lamps•Clock Bezels•PC Lay
Electrolytic Capacitors•Potentiometers•Car Clock•Transistor

2 For 1 Clock Sale

QUANTITY LIMITED

Any Clock Part With A Prefix "2" i.e. (2MA1026M) Is 2 For 1

ctifiers•Powerace•Sams Books•Diamond Tools•Panavice
afting Aids•Soldering Supplies•Edge Connectors•IC Socket
uits•Optoelectronics•Lamps•Multimeter•LED's•Data Books
emperature Clock•A/D & D/A•Nickle-Cadmium Batteries
ts•Heat Sinks & Accessories•Solder Wick•AND MORE

master charge

DIGI-KEY — DIGI-KEY — DIGI-KEY — DIGI-KEY — DIGI-KEY

The Big DIGI-KEY Discount makes a Big Price Difference SEE BELOW

INTEGRATED CIRCUITS

7400 TTL · 74LS00 TTL · 74C00 CMOS · 4000 CMOS · Micro. · Memory · A/D & D/A · Interface · Linear

TEXAS INSTRUMENTS I.C. SOCKETS

SOLDER TAIL DIP SOCKETS

- Low profile
- Face grip design for maximum retention force
- Redundant contact points
- YOUR CHOICE — TIN OR GOLD*
  (*Minimum of 50 microinches gold inlay on gold sockets)
- TEXAS INSTRUMENTS QUALITY

TIN INLAY SOLDER TAIL — Min. 200 Microinches Tin

Part No.	Description	1	10	100
C8508	8 pin solder tail tin	.13	1.16	9.45
C8514	14 pin solder tail tin	.22	2.03	16.58
C8516	16 pin solder tail tin	.26	2.33	19.05
C8518	18 pin solder tail tin	.29	2.60	21.29
C8520	20 pin solder tail tin	.32	2.92	23.85
C8522	22 pin solder tail tin	.35	3.18	26.10
C8524	24 pin solder tail tin	.38	3.49	28.58
C8528	28 pin solder tail tin	.44	4.05	33.08
C8540	40 pin solder tail tin	.63	5.78	47.25

GOLD INLAY SOLDER TAIL — Min. 50 Microinches Gold

Part No.	Description	1	10	100
C9508	8 pin solder tail gold	.29	2.67	21.83
C9514	14 pin solder tail gold	.34	3.11	25.43
C9516	16 pin solder tail gold	.39	3.58	29.25
C9518	18 pin solder tail gold	.44	4.02	32.85
C9520	20 pin solder tail gold	.49	4.46	36.45
C9522	22 pin solder tail gold	.54	4.90	40.05
C9524	24 pin solder tail gold	.59	5.34	43.65
C9528	28 pin solder tail gold	.69	6.25	51.08
C9540	40 pin solder tail gold	.98	8.94	73.13

WIRE WRAP DIP SOCKETS

- Standard profile
- Universal mounting and packaging capabilities
- Contacts accommodate .015" through .021" rectangular or round dual-in-line leads
- Wire wrap posts held to true position of .015" providing a true position of .020" on boards for efficient automatic wire wrapping
- YOUR CHOICE — TIN OR GOLD*
  (*Minimum .50 microinch gold inlay on gold sockets)
- TEXAS INSTRUMENTS QUALITY

TIN PLATED WIRE WRAP — Min. 200 Microinches Tin

Part No.	Description	1	10	100
C8108	8 pin wire wrap tin	.38	3.38	30.00
C8114	14 pin wire wrap tin	.50	4.50	40.00
C8116	16 pin wire wrap tin	.57	5.11	46.00
C8118	18 pin wire wrap tin	.69	6.23	55.40
C8120	20 pin wire wrap tin	.76	6.84	60.80
C8122	22 pin wire wrap tin	.83	7.46	66.20
C8124	24 pin wire wrap tin	.91	8.17	72.60
C8128	28 pin wire wrap tin	1.04	9.38	83.20
C8140	40 pin wire wrap tin	1.42	12.78	113.60

GOLD INLAY WIRE WRAP — Min. 50 Microinches Gold

Part No.	Description	1	10	100
C9108	8 pin wire wrap gold	.50	4.80	43.20
C9114	14 pin wire wrap gold	.73	6.83	61.43
C9116	16 pin wire wrap gold	.86	7.70	69.30
C9118	18 pin wire wrap gold	.93	9.25	83.25
C9120	20 pin wire wrap gold	1.15	10.20	91.80
C9122	22 pin wire wrap gold	1.34	11.15	100.35
C9124	24 pin wire wrap gold	1.39	12.30	110.70
C9128	28 pin wire wrap gold	1.69	14.05	126.45
C9140	40 pin wire wrap gold	2.29	19.45	175.05

Solder Tail Single Beam Dip Sockets

Body — 94 V-O polyester with Copper Alloy contacts. Accommodates standard IC leads up to .014" thick and .025" wide. Contact is designed and oriented to the insulator to grasp the broad "face" of the IC lead, allowing for low insertion and high retention forces. Socket is designed to achieve maximum density on boards.

TIN
Tin Plated Solder Tail
Single Beam Low Profile Dip Sockets

Tin Plated — 200 Microinch Min. — -40° to +75°C

Pins	Part No.	1	10	100
8	C8808	.10	.88	8.00
14	C8814	.17	1.53	14.00
16	C8816	.20	1.76	16.00
18	C8818	.22	1.98	18.00
20	C8820	.25	2.21	20.00
22	C8822	.27	2.43	22.00
24	C8824	.30	2.65	24.00
28	C8828	.35	3.11	28.00
40	C8840	.49	4.41	40.00

GOLD
Gold Inlay Solder Tail
Single Beam Low Profile Sockets

Gold Plated — 50 Microinch Min. — -65° to +125°C

Pins	Part No.	1	10	100
8	C9808	.28	2.48	22.00
14	C9814	.32	2.81	25.00
16	C9816	.37	3.28	29.00
18	C9818	.42	3.72	33.00
20	C9820	.47	4.16	37.00
22	C9822	.50	4.50	40.00
24	C9824	.54	4.84	43.00
28	C9828	.63	5.63	50.00
40	C9840	.90	8.10	72.00

TEXAS INSTRUMENTS GOLD EDGEBOARD CONNECTORS

Solder Tab · Solder Eye · Wire Wrap

RELIABLE, COST-EFFICIENT CONTACT DESIGN

- 50 (Wire Wrap) to 50 (solder Tail) micro-inches gold inlay over a nickel diffusion barrier.
- Copper-nickel-tin CA 725 alloy.
- Bifurcated contact points.
- Preloaded, cantilever spring design.
- Contacts are user removable.

* NOTE — Dimensions below are the pin center to center measurement followed by the distance separating the two pin rows.

H4 SERIES .100"x.200" EDGEBOARD CONNECTORS

H4 SERIES .125"x.200" EDGEBOARD CONNECTORS

H4 SERIES .156"x.200" EDGEBOARD CONNECTORS

ELECTRONIC HARDWARE KIT

CAT. NO. 1600 KIT
$14.95

TIME-TEMPERATURE PROGRAMMABLE MODULE

USER PROGRAMMABLE FOR:

- 12 or 24 Hour Display
- °F and/or °C, as well as virtually any number of temperature sensors
- Fixed or flashing colon format
- 50/60 Hz line frequency operation

MA 1026 by National Semiconductor

Instruction included with all orders

Cat. No.	Description	Cost
MA1026M	MA1026 Clock Module (Assembled and tested)	$19.95
MA1026P	Digi-Key Switching Panel Kit for MA1026M (includes P.C. Board, switches, hardware, two temperature sensors, two potentiometers)	11.95
MA1026T	Special transformer for MA1026M	2.95
MA1026B	Alarm buzzer for MA1026M	3.00
MA1026K	Includes MA1026M P, T, and B	34.95
MA1026X	3.58 Megahertz Crystal	3.95
MA1026C	Conventional Switch Set for applications where MA1026P is not used (includes one 501PB and ten 502PB switches)	3.95
MA1026R	Includes MA1026M, MA1026C, MA1026T, two temperature sensors and two potentiometer	30.80

For each additional sensor unit, the following are suggested:

LM334	Temperature transducer for MA1026M Module	1.53
40A32	300 ohm potentiometer for LM334 transducer	.32
502PB	Normally open switch	.45

THE "PROGRAMMABLE" CLOCK MODULES

USER PROGRAMMABLE FOR:

- 12 or 24 hour display
- fixed or flashing colon
- 50/60 Hz line frequency operation

MA1023 — 0.7" HIGH DIGITS

Cat. No.	Description	Cost
MA1023M	MA1023 Clock Module Only (Assembled and tested)	$ 9.95
MA1023P	Digi-Key Switching Panel Kit for MA1023 (includes P.C. Board, Switches, Hardware and Components)	6.95
MA1023T	Special Transformers for MA1023	2.95
MA1023B	Alarm Buzzer for MA1023	3.00
MA1023K	Includes MA1023M, P, T & B	19.95
MA1023C	Conventional switch set for applications where MA1023P is not used, includes one 501PB and 502PB	2.50
MA1023R	Clock Module, Conventional Switches, Transformer	15.45

MA1020 — 0.84" HIGH DIGITS

Cat. No.	Description	Cost
MA1020M	MA1020 Clock Module (Assembled and tested)	$13.95
MA1020P	Digi-Key Switching Panel Kit for MA1020 (includes P.C. Board, Switches, Hardware, Components)	7.95
MA1020T	Special Transformer for MA1020M	3.25
MA1020B	Alarm Buzzer for MA1020M	3.00
MA1020K	Includes MA1020M, P, T & B	26.95

SILICON TRANSISTORS

ITT RECTIFIERS

ITT SILICON ZENER DIODES

Call or Write for your Free DIGI-KEY Catalog

NEW! MA1032 Clock

Digital LCD Clock Module

- Operates from a single 1.5V Battery
- 0.5" LCD Display

Instructions Included In All Orders

Catalog No.	Description	Cost
MA1032M	LCD Clock Module only	$24.95
MA1032C	Switch for MA1032M	$ 2.85
MA1032K	MA1032M, MA1032C, & AA battery holder	$28.20

DIGITAL CLOCK BEZEL

THE J.M.J. DIGITAL DISPLAY BEZEL

WITH RED FILTER
Part No. 400

3-5/8" · 1" height

UNIVERSAL SIZE
HANDLES MOST REQUIREMENTS

Be Sure to Order the Proper Adaptor for Your Digital Clock

Part	Description	Price
400	Digital Display BEZEL with Red Filter	$ 6.95
420	Mounting Adapters for MA1001, MA1002, etc.	.69
421	Mounting Adapters for MA1010, MA1020, MA1026	.69
422	Universal PC Board Mounting Adapters	.69
423	Mounting Adapter for MA1023	.69

DIGI-CLOCK KIT

- 12 VDC — Ideal for Car, Van or Boat!
- Trouble-free Module!
- 270° Swivel Mount
- Inlaid Walnut Chrome Trim Bezel!
- Ideal for Car Van or Boat!
- 3-5/8" x 2-3/16" Tall x 2-1/8" Deep!
- Quick and Easy to Install!

Part No. 5001K
ONLY $24.95

Panasonic TSW Series

Large Aluminum Electrolytic Capacitors

DIGI-KEY Part No.	Working Voltage (W.V.)	Cap. (µF)	1	10	100
P6500	16	3300	$1.68	$12.96	$116.60
P6501		4700	2.06	15.87	142.85
P6502		6800	2.67	20.51	184.60
P6503		10000	3.35	25.80	232.90
P6504		15000	4.77	36.72	330.55
P6505	25	2200	1.72	13.26	119.40
P6506		3300	2.11	16.22	145.95
P6507		4700	2.65	20.36	183.20
P6508		6800	3.48	26.80	241.20
P6509		10000	4.49	34.58	311.20
P6510		15000	5.78	44.43	399.90
P6511	35	1000	1.43	11.00	99.10
P6512		2200	1.93	14.87	133.90
P6513		3300	2.60	20.01	180.10
P6514		4700	3.33	25.65	230.10
P6515		6800	4.28	32.93	296.40
P6516		10000	5.48	42.17	379.50
P6517	50	1000	1.75	13.46	121.10
P6518		2200	2.69	20.67	185.95
P6519		3300	3.70	28.45	256.00
P6520		4700	4.82	37.07	333.65
P6521		6800	5.87	45.12	406.10
P6522	100	470	2.02	15.53	139.75
P6523		1000	3.40	26.15	253.30
P6524		2200	5.46	41.98	377.80
P6525	200	220	2.55	19.63	176.65
P6526		330	3.52	27.07	243.60
P6527		470	4.49	34.54	310.85
P6528	250	150	2.58	19.86	178.75
P6529		220	4.13	31.78	286.05
P6530		330	5.84	44.89	404.00
P6531		470	7.62	58.62	527.55

PANASONIC K-SERIES CAPACITORS

New Panasonic K-series are miniature, low cost aluminum electrolytic capacitors. Their size and performance characteristics make them viable alternatives to tantalums in many applications.

CAPACITANCE TOLERANCE: 20%
D.C. LEAKAGE CURRENT, MAX. I 0.01 C V OR 3uA
ALL K-SERIES CAPACITORS WE CARRY ARE RADIAL

DIGI-KEY PART NO.	CAPACITANCE UF	WORKING VOLTAGE DC	1	10 PAK
P800	22	6.3	.24	2.03
P801	33		.25	2.13
P802	47		.26	2.18
P803	100		.30	2.56
P804	22	10	.25	2.13
P805	33		.26	2.33
P806	47		.28	2.37
P807	10		.25	3.07
P826	3.3		.25	2.07
P827	4.7		.25	2.13
P828	10		.28	2.38

Panasonic KL-Series Capacitors

Ultra Miniature Aluminum Electrolytic Capacitors
The KL-Series is a tantalum sub for many app.

DIGI-KEY Part No.	Rating WV	Rating µF	1	10	100	1,000
P850	6.3	22	.27	2.29	19.06	171.56
P851	16	10	.27	2.29	19.06	171.56
P852	25	4.7	.27	2.29	19.06	171.56
P853	25	3.3	.27	2.29	19.06	171.56
P854	50	2.2	.27	2.29	19.06	171.56
P855	50	1.0	.27	2.29	19.06	171.56
P856	50	.47	.27	2.29	19.06	171.56
P857	50	.33	.27	2.29	19.06	171.56
P858	50	.22	.27	2.29	19.06	171.56
P859	50	.1	.27	2.29	19.06	171.56

PLESSEY "MINI-BOX"

Metalized Poly Cap Kit

140 CAPACITORS

Price includes convenient divided plastic box with bin guide for easy storage and quick access.

ASSORTMENT OF 14 POPULAR "MINI-BOX" CAPACITORS

CAT. NO. 3050P-Kit
ONLY $35.95

PANASONIC ELECTROLYTIC KIT

150 CAPACITORS

Price includes convenient divided plastic box with bin guide for easy storage and quick access.

ASSORTMENT OF 15 POPULAR CAPACITORS

Cat. No. P6200-Kit
ONLY $35.95

PANASONIC ELECTROLTYIC CAPACITORS

Axial · Radial

Value UF	WV D.C.	Axial 1	Axial 10	Axial 100	Radial 1	Radial 10	Radial 100
22	/6.3	.18	1.54	12.83	—	—	—
33	/6.3	.20	1.68	14.04	.14	1.12	9.31
47	/6.3	.21	1.74	14.48	.14	1.16	9.59
100	/6.3	.22	1.83	15.22	.16	1.33	11.05
220	/6.3	.28	2.34	19.53	.21	1.78	14.80
220	/100	1.09	9.26	77.18	.96	8.22	68.47
330	/100	1.30	11.10	92.53	1.25	10.70	89.13
470	/100	1.81	15.46	128.80	1.78	15.25	127.04
1000	/100	3.16	27.09	225.72	—	—	—

PANASONIC DISC CAPACITORS

NEW! KIT
310 DISC CAPACITORS

Prices includes convenient divided plastic box with bin guide for easy storage and quick access.

ASSORTMENT OF 10 POPULAR VALUES PANASONIC QUALITY

CAT. NO. DH-KIT
ONLY $24.95

(Tolerance: A — plus minus 5%, B — plus minus 10%, C plus 80% / minus 20%)

PANASONIC POLYESTER CAPACITORS

100 VDC plus minus 10% TOLERANCE

NEW! KIT
150 POLYESTER CAPACITORS

Price includes convenient divided plastic box with bin guide for easy storage and quick access.

ASSORTMENT OF 15 POPULAR VALUES PANASONIC QUALITY

CAT. NO. M-KIT
ONLY $34.95

PANASONIC METALLIZED POLYESTER CAPACITORS

NEW! KIT
170 METALIZED POLYESTER CAPACITORS

Price includes convenient divided plastic box with bin guide for easy storage and quick access.

ASSORTMENT OF 15 POPULAR VALUES PANASONIC QUALITY

CAT. NO. E-KIT
ONLY $54.95

DIGI-KEY Part No.	Working Voltage	µF	Pak Of 1	Pak Of 10	Pak Of 100	Pak Of 1,000
E1104	100	.1	.23	1.99	16.53	148.73
E1124	100	.12	.25	2.12	17.63	158.73
E1154	100	.15	.27	2.28	18.95	170.55
E1184	100	.18	.29	2.49	20.73	186.53
E1224	100	.22	.32	2.68	22.27	200.37
E1274	100	.27	.34	2.91	24.25	218.25
E1334	100	.33	.37	3.18	26.45	238.05
E1394	100	.39	.41	3.44	28.65	257.85
E1474	100	.47	.43	3.68	30.65	275.85
E1564	100	.56	.47	4.02	33.45	301.05
E1684	100	.68	.52	4.44	36.93	332.35
E1824	100	.82	.58	4.94	41.13	370.13
E1105	100	1.0	.63	5.35	44.52	400.62
E4184	400	.18	.55	4.68	38.98	350.78
E4224	400	.22	.57	4.89	40.73	366.53
E4274	400	.27	.69	5.85	48.73	438.53
E4334	400	.33	.75	6.38	53.15	478.35
E4394	400	.39	.82	7.02	58.48	526.28
E4474	400	.47	.91	7.78	64.80	583.20
E4564	400	.56	1.07	9.14	76.12	685.00
E4684	400	.68	1.21	10.37	86.42	777.75
E4824	400	.82	1.29	11.03	91.90	826.99
E4105	400	1.0	1.35	11.50	95.83	862.43
E4125	400	1.2	1.47	12.60	105.00	945.00
E4155	400	1.5	1.59	13.56	112.98	1016.80
E4185	400	1.8	1.88	16.10	134.13	1207.15
E4225	400	2.2	2.15	18.34	152.85	1376.55

PANASONIC RESIN DIPPED TANTALUM CAPACITORS

NEW! KIT
CAPACITORS

Prices includes convenient divided plastic box with bin guide for easy storage and quick access.

ASSORTMENT OF 15 POPULAR VALUES PANASONIC QUALITY

CAT. NO. F-KIT
ONLY $79.95

Digi-Key Part No.*	CAP (µF)	Voltage Volt DC	1	10	100	1000
P2000	3.3	3.15	.38	3.21	26.70	240.30
P2001	6.8	3.15	.38	3.21	26.70	240.30
P2002	10	3.15	.41	3.47	28.85	259.65
P2003	15	3.15	.46	3.88	32.32	290.81
P2004	22	3.15	.53	4.47	37.23	335.02
P2005	33	3.15	.63	5.40	45.00	405.00
P2006	47	3.15	.77	6.61	55.05	495.45
P2007	68	3.15	.98	8.35	69.54	625.83
P2008	100	3.15	1.29	11.04	91.97	827.77
P2009	150	3.15	3.73	31.83	266.04	2394.34
P2010	220	3.15	4.72	40.44	366.95	3032.55

5% CARBON FILM RESISTORS

¼ WATT RESISTOR ASSORTMENTS

RS125	Set of 5 each of the 73 standard 5% ¼ watt carbon film resistors in the series 1.0, 1.2, 1.5, 1.8, 2.2, etc. through 1.0 meghom (365 total pcs.)	$9.90
RS225	Set of 5 each of the 72 standard 5% ¼ watt carbon film resistors in the series 1.1, 1.3, 1.6, 2.0, 2.4, etc. through 910 kilohm (360 total pcs.)	$9.90

½ WATT RESISTORS ASSORTMENTS

RS150	Set of 5 each of the 73 standard 5% ½ watt carbon film resistors in the series 1.0, 1.2, 1.5, 1.8, 2.2, etc. through 1.0 meghom (365 total pcs.)	$9.90
RS250	Set of 5 each of the 72 standard 5% ½ watt carbon film resistors in the series 1.1, 1.3, 1.6, 2.0, 2.4, etc. through 910 kilohm (360 total pcs.)	$9.90

E.F. JOHNSON ALUMINUM SPACERS

Round Tubular · Round Threaded · Hex Threaded

MOLEX I.C. SOCKET PINS

.95/C	9.10/M	42.00/5M	300.00/50M

The Digi-Key volume discount and handling charges are simple to apply. Most items sold by Digi-Key may be combined for a volume discount. Items that are not discountable are identified by the suffix-ND following the part number. After writing your order, total all of the discountable items and apply the appropriate discount. To this subtotal, add the non-discountable items. Then add the handling charge. We pay all shipping and insurance to addresses in the U.S.A., Canada and Mexico when check or money order accompanies order.

WHEN ORDERING BY PHONE, CALL: 1-800-346-5144 (Mn., Ak., Hi., call 218-681-6674) By mail send your order to: DIGI-KEY, Highway 32 South, Thief River Falls, MN 56701

You may pay by check, money order, Master Charge, VISA or C.O.D. **DIGI-KEY GUARANTEE:** Any parts or products purchased from Digi-Key that prove to be defective will be replaced or refunded if returned within 90 days from receipt with a copy of your invoice. Prices subject to change without notice.

HANDLING CHARGES

$ 0.00-$ 9.99	Add $2.00
$ 10.00-$25.00	Add $0.75
$ 25.00-$49.99	Add $0.50
$ 50.00-$99.99	Add $0.25
$100.00 & Up	No Charge

VOLUME DISCOUNT

$ 0.00-$ 99.99	NET
$ 100.00-$249.99	Less 10%
$ 250.00-$499.99	Less 15%
$ 500.00-$999.99	Less 20%
$1000.00 & Up	Less 25%

CIRCLE 146 ON READER SERVICE CARD

outpost: atari
ATARI 800

A Beginner's Guide to Character Sets

David and Sandy Small

When the Atari computer was first designed, Atari planned on selling a good deal of software for it. They knew that the more varied and interesting displays they could program for it, the more software they could sell. So they designed in as much software-controlled hardware flexibility as possible. In this way they hoped to achieve widely varied effects, but never to have to change the basic hardware.

Over the past few months we've been looking at the capabilities of the Atari. We've covered playfield (i.e., display list generated) graphics and become familiar with player-missile graphics. In this column I'll cover another of the many playfield features: the ability to reprogram a character set.

"What's a character set?" you ask. A character set is the table of shapes the computer uses to define what a character looks like. This character set, or shapetable, is what makes an "A" character look different from a "B" character onscreen. With the Atari, these shapes may be altered at will.

With many computers, you're stuck with the characters the designers provide. The shapes are stored in a ROM, which is an unmodified memory, and can't be changed except by making a new chip. This places a limitation on those machines, for reprogramming character shapes is a powerful tool for certain applications. Here's an example.

Let's say you are writing a program that will be a lesson dealing with the Russian language. Naturally, you would like to be able to write words in that language. But since the Russian language has a different alphabet from English, with most machines, you would be stuck at this point. Unless you use high resolution graphics to draw characters—a slow and clumsy process—you can't get them onscreen.

On the Atari, however, it's easy to design your own characters. You can use those new letters for the lesson, and save yourself time and effort.

If you should happen to need some small, high resolution figures on a character screen, but don't want to hassle with mixing graphics modes, a character set might be just the thing. You can control dots the size of an individual graphics 8 pixel with custom characters and you can mix the special symbols you create right in with your text. For mathematicians in need of special characters (summation, integral) this could be a real help.

As soon as you begin to consider characters as graphics 8 figures drawn at high speed onscreen, more and more interesting posibilities will occur to you. So first let's review a bit about character shapes and generation, then learn how to modify them.

Character Shapes

The Atari plots letters and graphics on the screen using the same individual TV dots. It uses 320 horizontal dots and 192 scan lines for this purpose. Characters are 8 x 8 groups of dots, some lit, some not. Since there are 320 horizontal dots, that's 320/8 or 40 characters across and 192/8 or 24 rows. There is no space on the screen between characters; that space is provided within the character shapes. (Brief detour: This thoughtful add-on makes possible continuous script letters, which "flow" from one to the next with no interruption. It also allows screen graphics using characters that have no breaks in them.)

A character shape is stored as an 8 x 8 group of bits. A lit dot is represented by a 1 bit, an unlit dot by a 0 bit. (See Diagram 1.) Since each horizontal "slice" of the character is 8 bits, the Atari designers put each slice into one byte, making for eight bytes total per character. There are 128 different characters possible, and they are stored all grouped together, so the compatible "character set" is 128 x 8 or 1024 bytes long. (See Diagram 2.)

```
Byte # 1     0 0 0 0 0 0 0 0
Byte # 2     0 1 1 1 1 0 0 0
Byte # 3     0 1 1 0 1 1 0 0
Byte # 4     0 1 1 0 0 1 0 0
Byte # 5     0 1 1 0 0 1 0 0
Byte # 6     0 1 1 0 1 1 0 0
Byte # 7     0 1 1 1 1 0 0 0
Byte # 8     0 0 0 0 0 0 0 0

             8 bytes in memory
             per character.
```

=

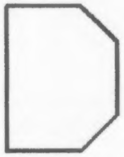
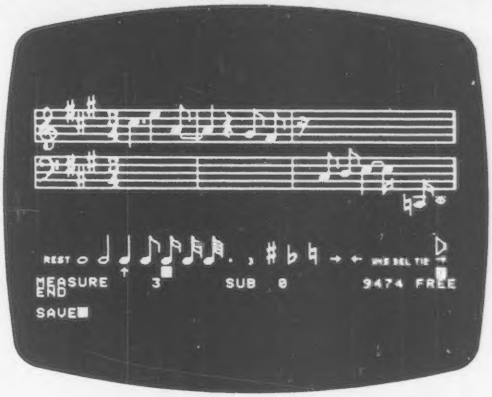


Diagram 1.

ALF Music Synthesizer



With the ALF software, entry of music is easy, fast and accurate.

The ALF Apple Music Synthesizer (AMS) is an easy to use peripheral which allows you to program music into an Apple II computer using standard musical notation. The ALF kit includes the synthesizer board (plugs into any peripheral slot), exceptional quality software, and an extensive user manual.

Sophisticated Music Entry Program

Sheet music is easily entered using the Apple game paddles. The high-resolution ENTRY program features the familiar music staff with a "menu" of musical items listed beneath it (note lengths, rests, edit commands, accidentals, etc.). One game paddle moves a cursor up and down the music staff and is used to select the note pitch; the second paddle chooses from the menu items (note length, etc.) With the ALF hi-res ENTRY program, you won't have to use cryptic codes to select note parameters.

As you program sheet music with ENTRY, measure bars are inserted automatically (and note values are tied over the bar where necessary). Key signatures are also automatic—you don't have to keep writing in every sharp or flat!

Three monophonic, individual parts can be programmed with each ALF Music Synthesizer. Two boards are required for stereo. A total of three synthesizers can be used simultaneously for a maximum of nine voices. By controling the envelope (or shape) of each voice, many different instrumental sounds can be simulated.

Eight-octave Range

The ALF Music Synthesizer has a pitch range of eight octaves—a wider range than a grand piano. The ALF can also play semitones—"blues notes" or the pitches in between the keyboard notes of a piano. (The pitch range is from 27.5 to 55,000 Hertz, well beyond the limits of human hearing.) Tuning accurancy is virtually perfect within two cents of pitch value.

Every parameter of the ENTRY program can be changed again and again during a musical piece. For example, you can make changes in key, time signature, volume, and timbre (envelope). Parts can be edited at any time, also. Notes can be added or deleted, note length can be changed, as well as pitch, volume, etc.

You can save songs on either cassette or disk, and play them back using either ENTRY or PLAY. The playback speed is adjusted with one of the game paddles, and can be varied during the playback, if you wish to change the overall tempo.

Colorful Playback Display

The ALF Music Synthesizer features a 16-color low-res graphic display during song playback. Each musical part is represented on a stylized piano "keyboard"—the intensity of the note determines the color, and the pitch is shown in relation to "middle C".

The ALF Music Synthesizer requires the use of an external audio amplifier. Stereo programming is possible with the use of two or three synthesizer boards.

The ALF software includes the ENTRY and PLAY programs, sample songs, an introduction to "envelope shaping", and demonstrations of advanced uses of the synthesizer.

Nine Voices for only $198

The new ALF "AM-II" music synthesizer offers an unbeatable value for the Apple owner who is a music hobbyist. With nine voices on a single music board for $198.00, the AM-II is the most economical device for creating music with the Apple.

The AM-II uses the same excellent ENTRY and PLAY programs as the more sophisticated ALF Music Synthesizer (AMS); the same hi-res graphic display from which notes are selected with the Apple game paddles (not typed with cryptic codes). All of the conveniences of the ENTRY program apply—easy editing, playback with low-res display, ability to save songs on cassette or disk, etc.

The AM-II has **stereo output** (3 voices in left, 3 voices in the middle, 3 voices in the right).

How can the AM-II offer so much for only $198.00? The two basic differences between the AM-II and the ALF Apple Music Synthesizer (AMS) are pitch accuracy and dynamic range. The AM-II has an accurate pitch range of about six octaves. Pitch values above the treble staff become increasingly inaccurate. Also, the AM-II has a dynamic range of 28db, with 16 different volume levels, (the AMS has a dynamic range of 78db).

The AM-II is manufactured with the same high quality standards as other products from the ALF Corporation. No sacrifice has been made in reliability; the new AM-II is simply a great bargain.

Professional musicians will still want to use the original Apple Music Synthesizer (AMS) for its extended range and volume controls (the AMS has a range of 8 octaves). But for the Apple owner who is interested in music as a hobby, the AM-II is the best music peripheral value available today.

Requires: 16K Apple II or Apple II Plus, cassette or Disk II, and an external audio amplifier (all necessary patch cords are included).

AM-II ALF/Apple Synthesizer	$198.00
AMS ALF/Apple Synthesizer	248.00

To order, send payment plus $3.00 shipping and handling to Peripherals Plus, 39 E. Hanover Ave. Morris Plains, NJ 07950. Credit card customers should include card number and expiration date of Visa, MasterCard or American Express. Credit card customers may also order toll-free:

800-631-8112

(In NJ call 201-540-0445)

Peripherals Plus

39 E. Hanover Avenue, Morris Plains, NJ 07950

Apple is the registered trademark of Apple Computer, Inc.

CIRCLE 239 ON READER SERVICE CARD

Atari, Continued...

Every time a character is displayed, the Atari consults this table. Let's quickly examine the process.

When Antic finds a display list entry to generate characters (modes 0-1-2 to Basic memory users), he looks to his current location in display memory, kept in an internal register.

Let's assume graphics 0 for now. One graphics 0 instruction means 40 characters are plotted in one row (in one display block). In a character mode, one byte of display memory represents one character, so Antic fetches 40 bytes. Each character has a unique number, 0-127, and Antic uses that number to look up the shape of the characters in the character set. Let's see how it finds the shape.

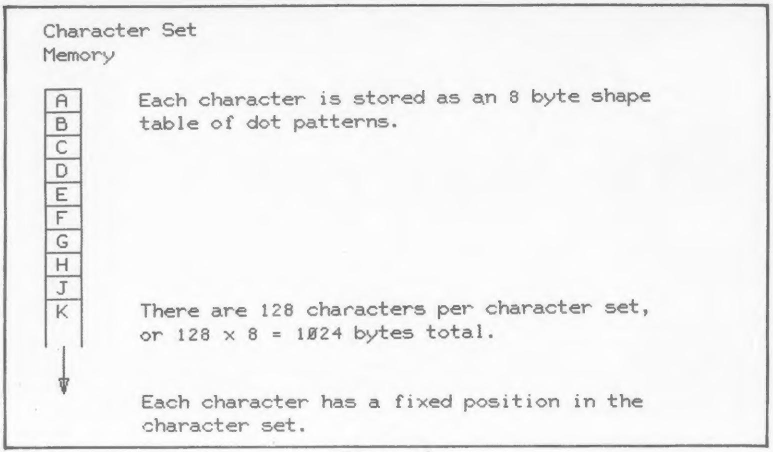
First Antic must find the character set. That's easy, it is POKEd to Antic every sixtieth of a second by the operating system as part of the screen refresh process. It is given to Antic from location 2F4 hex or 756 decimal in memory.

This location we'll call CHBAS, for "character set base." The number in this byte, when mutiplied by 256, specifies the start of the character set in memory.

(Why by 256? In the Atari, like all 6502 processor machines, memory is divided up into "pages." Each page is 256 bytes long, corresponding to 8 bits of address. In a 16-bit address, the upper 8 bits specify which page number, and the lower 8 bits specify which byte within the page. Because the character set always starts on an even page mark, we only need to tell Antic where the first page of the character set is.)

The character number in display memory, known as the "internal character set number" (*not* ATASCII!) is multiplied by 8. This is then added to the CHBAS*256 number to give Antic the starting address in memory of where the shape table for the character is stored. (See Diagram 3.) When displaying the character, Antic grabs the first byte of the shape table, displays it as eight on or off dots according to the bits in the shape table, then for the next line down, it just moves down one byte in the shape table. After eight passes, it has moved down eight scan lines and eight bytes and is finished with the character. (See Diagram 4.)

Now if we were to tell Antic the shape table began somewhere else in memory, he would faithfully look to the new location and start using whatever data was found there to display characters. You will recall a few columns back we told Antic that display memory was located in low memory, to watch him display pages 0 and 1 of memory as characters. This is the same idea. If the new area of memory happens to be a table of character shapes, redefined to what you want them to be, Antic will use them without complaint. If

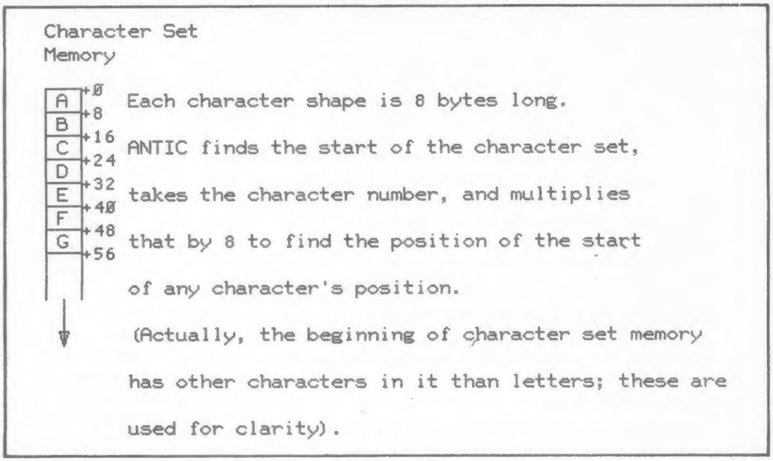


Each character is stored as an 8 byte shape table of dot patterns.

There are 128 characters per character set, or 128 x 8 = 1024 bytes total.

Each character has a fixed position in the character set.

Diagram 2.

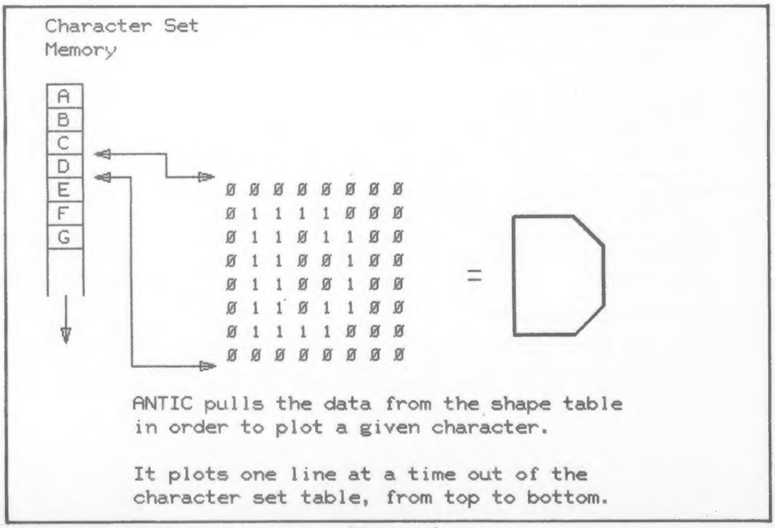


Each character shape is 8 bytes long.

ANTIC finds the start of the character set, takes the character number, and multiplies that by 8 to find the position of the start of any character's position.

(Actually, the beginning of character set memory has other characters in it than letters; these are used for clarity).

Diagram 3.



```
0 0 0 0 0 0 0 0
0 1 1 1 1 0 0 0
0 1 1 0 1 1 0 0
0 1 1 0 0 1 0 0
0 1 1 0 0 1 0 0
0 1 1 0 1 1 0 0
0 1 1 1 1 0 0 0
0 0 0 0 0 0 0 0
```

ANTIC pulls the data from the shape table in order to plot a given character.

It plots one line at a time out of the character set table, from top to bottom.

Diagram 4.

EXCITING DISCOUNTS

apple® II 48K computer

DISK with CONTROLLER
NEW DOS 3.3 $529
without . . . $445
Nearly Everything
for Apple

$1095

APPLE II 64K
$1249

WE WILL
MEET OR BEAT
ANY ADVERTISED PRICES
ON MOST ITEMS IF MERCHANDISE
IN STOCK

APPLE II 48K
$1095

ACCESSORIES FOR YOUR APPLE

Amdek 12" Color Monitor	349
Amdek 12" Green Screen	169
Amdek/Leedex 12" B/W	129
NEC 12" Green Screen	239
Sanyo 9" B/W	169
Dysan Disks (pkg 10)	50
Memorex Disks (pkg 10)	40
Verbatim Datalife Disks	35
A/D D/A by Mtn. Comp	319
Andromeda 16K RAMcard	179
Game Paddles by TG	32
CCS Interface Cards	CALL
CPS Multifunction by Mtn. Comp	239
Expansion Chassis by Mtn. Comp	599
Hayes Micromodem II	319
Hayes Smartmodem	239
Joystick for Apple	47
ROMPLUS by Mtn. Comp	135
SSM AIO Serial/Parallel Card	149
SuperTalker Speech Synthesizer	239
Versa-Writer Digitizer Drawing Sys	239
Videx Keyboard Enhancer	115
Videx Videoterm	319
Z-80 SOFTCARD CP/M by Microsoft	295
EPSON Printers	CALL
Paper Tiger 560 w/graphics	1495
Starwriter Daisywheel by C. Itoh	1750

APPLE SOFTWARE

Alien Rain by Broderbund	22
Asteroid Field by Cavalier	19
CCA Data Mgmt	84
Cyber Strike by Nasir	29
Data Factory by Microlab	129
Desktop Plan II	169
DB Master II by Stoneware	199
DOS BOS by Beagle Bros	21
Gorgon by Nasir	25
Peachtree Bus. Pkgs	CALL
Personal Filing System	84
Pool 1.5	29
Pulsar II by Nasir	24
Raster Blaster by Budgeco	24
Sargon II Chess	32
Space Eggs by Nasir	25
Space Invader/Cosmos Mission	24
Sub-Logic FS-1 Flight Sim	34
SuperText II by Muse	129
Ultima by Lord British	29
Visicalc II	169
Visitrend/Visiplot	229

LARGE SELECTION
OF SOFTWARE IN STOCK
CALL FOR FREE BROCHURE

CALL 1-800-854-2833

PHONE ORDERS MON.-SAT. 8 TO 6 P.S.T.

master charge

TO ORDER: Mail orders may send cashier check, money order or personal check (allow 10 business days for personal or co. checks to clear). No COD or Purchase Orders accepted. Include 4% for UPS shipping, handling and insurance. Shipments to CA address must also include 6% sales tax. Please include phone number on all orders. RUSH ORDERS AVAILABLE using Visa or Mastercard (subject to credit card approval from our authorization center). Please add 6% for rush shipment. Rush orders are shipped the same day if called-in before 12:00 p.m. PST. Please have credit card number, expiration date and billing address ready when you call. Bank wires also accepted. Please call for bank info. Minimum $10 shipping charge on all orders.

VISA®

(714) 579-0330 • MAIL TO: 1251 BROADWAY, EL CAJON, CA 92021

CIRCLE 134 ON READER SERVICE CARD

AUTHORIZED
APPLE
SALES &
SERVICE

COMPUTER CS SPECIALTIES

DIV. OF
COMPUTER
METRICS
INC.

not, he will still use them, but what you see won't be much like a character display!

Now we can't change the existing character set. That's stored in ROM at E000 hex and cannot be modified. So what we need to do is copy that ROM character set into RAM, where we *can* modify it, and tell Antic to start looking to RAM for a character set. All we do to change where Antic looks is to POKE a new page number in memory into location 756. A sixtieth of a second later, the operating system will give Antic that new value as part of the screen refresh, and he will start using it.

Examples

Time now for some examples and programs. Let's run some routines to help us visualize the process and see how characters are stored.

Program 1 begins at the start of the unmodifiable character set the Atari normally uses, the ROM character set. It fetches the 8 bytes per charater, breaks each byte up into individual bits, and displays them as 0's and 1's. (Well, actually, it displays 0's as spaces to make the 1's stand out). It goes through the entire character set this way, displaying the characters in binary patterns. See the listing for an example.

You will soon notice that characters are not stored in ATASCII order. They are in the order of the internal character set, which is a different thing. You can find a listing of the internal order on page 55 of your Basic manual.

Program 2 dumps the specified character to the printer; just type in the letter whose bit pattern you want to display. It is converted into an ATASCII number, then into the internal character set number, then displayed. Hence, this program is handy for showing how to convert from ATASCII to internal format. To find the right bytes in the character set, the internal number is just multiplied by 8 and added to the number that represents the start of the character set, which you'll recall is just how Antic does it (CHBAS+(8*char number)).

The character set at which we are currently looking is in ROM. Let's learn how to move it to RAM so we can modify it. There are three steps we must follow:

1. Finding a place to put it; we need 1024 free contiguous bytes of RAM.
2. Copying the ROM character set to RAM.
3. Changing the "pointer" Antic uses to find the character set from its old ROM location to the new RAM location.

Step 1 is tricky. To understand how to do this, we must delve into some Atari memory secrets.

```
70 REM PROGRAM 1
80 DIM BIN$(8)
90 REM O.S. SHADOW FOR CHBAS=2F4 HEX
100 CH=2*256+15*16+4
130 CHBAS=PEEK(CH)*256
200 REM
210 FOR CHNUM=0 TO`127
211 PRINT CHNUM,CHR$(CHNUM)
212 GOSUB`220
213 PRINT
214 NEXT CHNUM
215 REM FIDDLE CHR$ VALUE TO ROM VAL
220 IF CHNUM<32 THEN CH=CHNUM+64
230 IF CHNUM<96 THEN IF CHNUM>31 THEN CH=CHNUM-32
240 IF CHNUM>95 THEN CH=CHNUM
250 REM PULL 8 BYTES, TRANSLATE,PRINT
260 CLOC=CHBAS+(8*CH)
270 FOR B=0 TO 7
280 BYTE=PEEK(CLOC+B)
290 GOSUB 500
300 PRINT B+1;"* ";BIN$
310 NEXT B
320 RETURN
500 REM DECIMAL TO BINARY
505 BIN$="        "
510 DIV=128
515 BYTE1=BYTE
520 FOR T=1 TO 8
530 BIT=INT(BYTE1/DIV)
535 IF BIT=1 THEN BIN$(T,T)="1"
540 IF BIT=1 THEN BYTE1=BYTE1-DIV
550 DIV=INT(DIV/2)
560 NEXT T
610 RETURN
```

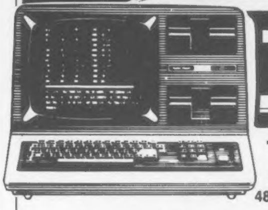
Program 1.

```
70 REM PROGRAM 2
80 DIM BIN$(8)
90 REM O.S. SHADOW FOR CHBAS=2F4 HEX
100 CH=2*256+15*16+4
130 CHBAS=PEEK(CH)*256
200 PRINT "ENTER CHARACTER NUMBER"
210 INPUT CHNUM
211 PRINT CHNUM,CHR$(CHNUM)
212 GOSUB 220
213 PRINT
214 GOTO 200
215 REM FIDDLE CHR$ VALUE TO ROM VAL
220 IF CHNUM<32 THEN CH=CHNUM+64
230 IF CHNUM<96 THEN IF CHNUM>31 THEN CH=CHNUM-32
240 IF CHNUM>95 THEN CH=CHNUM
250 REM PULL 8 BYTES, TRANSLATE,PRINT
260 CLOC=CHBAS+(8*CH)
270 FOR B=0 TO 7
280 BYTE=PEEK(CLOC+B)
290 GOSUB 500
300 PRINT B+1;"* ";BIN$
310 NEXT B
320 RETURN
500 REM DECIMAL TO BINARY
505 BIN$="        "
510 DIV=128
515 BYTE1=BYTE
520 FOR T=1 TO 8
530 BIT=INT(BYTE1/DIV)
535 IF BIT=1 THEN BIN$(T,T)="1"
540 IF BIT=1 THEN BYTE1=BYTE1-DIV
550 DIV=INT(DIV/2)
560 NEXT T
610 RETURN
```

Program 2.

When the Atari is first turned on, a check is made to determine where RAM ends. This can be anywhere from 8K to 48K from the beginning of memory; it depends on how many boards you have installed. In location 106 decimal (6A hex) is stored the page number of the first byte of nonexistent memory. In other words, 256*PEEK(106) is the address of the first byte of nonexistent memory.

The Atari uses the very top of RAM memory, wherever that might be, for the display memory and display list storage. Right below that is free RAM, and below that is the Basic storage. (Hence, Basic and the graphics modes "grow" toward each other into free RAM when they use more memory.) (See Diagram 5.) So, whenever a graphics command is executed, and the Atari needs to set up a new display



DISCOUNT TRS-80™

TRS-80 MODEL III

48-K $2100 16-K $850

2 DISK RS-232 (ALL RADIO SHACK EQUIPMENT)

TRS-80 MODEL II 64-K $3350

TRS-80 8.4 MEGABYTE HARD DISKS (PRIMARY UNIT) . . . $4040.

TRS-80 COLOR 4-K $315 16-K $495 32-K $635

WE HAVE COLOR DISK DRIVES 0 — $509 1-2-3 — $339

FREE OUT-OF-STATE TAXES AND SHIPPING COSTS

WE ALSO CARRY A FULL LINE OF PRINTERS, COMPUTERS AND ACCESSORIES

WARRANTIES HONORED BY ALL COMPANY OWNED RADIO SHACK STORES OR COMPUTER CENTERS - T.M. TANDY CORP.

PERRY OIL & GAS INC.

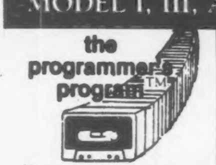
DEALERSHIP R162 • 137 NORTH MAIN ST., PERRY, MICHIGAN 48872

WE ACCEPT CERTIFIED CHECKS
CASHIERS CHECKS
AND MONEY ORDERS

PHONE (517) 625-4161, MICH.
FOR OUR PRICES,
PLEASE CALL TOLL FREE
1-800-248-3823

CIRCLE 235 ON READER SERVICE CARD

SOFTWARE FOR YOUR 16K TRS-80 COLOR MODEL I, III, ATARI 400/800, APPLE II



appletree™ MAGATARI™ TRC™

Do you know all the innovative ways of using Basic commands? The staff at the Programmer's Institute have spent 8 months designing a set of programs explaining everything the manuals omit. And much more.

The Programmer's Program leads you step by step through the fundamentals of programming your computer. Then you explore the finer points . . . multiple loops, queues, stacks, game programming, sorts, trees, boolean logic, and memory savers. All these methods make your programming tasks easier and more efficient.

Difficult (and very useful) programs are built before your very eyes, and designed so you learn at your own speed! **The Programmer's Program is a must for every owner of a microcomputer** ($40)

On cassette or diskette*, our magazines are designed explicitly for your computer. Included every month are 6-10 ready-to-load programs ranging from games, home entertainment, and personal finance, to more of our unique "teaching" programs. We will also keep you informed of the latest hardware, software, and publications compatible with your microcomputer.

Our December issue will include:

1. CHECKERS!!
2. Algebra Test.
3. Concentration Card Game with graphics.
4. Computerized Telephone Directory.
5. Christmas Carols played by your computer!
6. Test your Trivia knowledge.
7. Two more of our special "Teaching" Programs!
8. . . . and as always you get our 100% commitment to excellence and service from the Programmer's Institute.

(Back issues are available!)

Later issues will include backgammon, home budget, forecasting, stock market, and many more. The price per subscription to TRC, APPLETREE, or MAGATARI is $50 per year, $30 per ½ year, and $10 for a trial issue. **Don't miss out on our December issue.**

If you order now, you will receive our complete home accounting system (Reg. 39.95) **ABSOLUTELY FREE** with any $50.00 order. Purchase both above packages and your net cost is only $75.00. This is our Christmas special, so don't wait! **ORDER TODAY!!**

THE PROGRAMMER'S INSTITUTE

A Futurehouse Company
P.O. Box 3191 Dept. A
Chapel Hill, N.C. 27514
(919) 489-2198
MC & Visa Welcome

name ______________________
address ______________________
city/st ______________________

☐ Programmer's Program ☐ Year Subscription ☐ both ☐ Trial Issue
Computer Model ____________ ☐ Cassette ☐ Diskette

TRC and the programmer's program are trademarks of Futurehouse.

*All software available on cassette for the TRS-80 Model I, Color Extended Basic, Atari 400/800. On diskette for the Model III, Apple II (Add $5.00 for each diskette order).

CIRCLE 165 ON READER SERVICE CARD

It's time Your Computer stopped just playing games

and started doing some work around the house!

Let Creative Software's home programs turn your ATARI® or VIC® into a really useful household appliance—the results may well amaze you!

TITLE	ATARI 400/800	VIC (cassette only)
• Household Finance	34.95 cassette 39.95 disk	34.95
• Home Inventory	19.95 cassette 24.95 disk	14.95
• Car Costs	19.95 cassette 24.95 disk	14.95

CREATIVE SOFTWARE

201 San Antonio Circle, #270
Mountain View, CA 94040
(415) 948-9595

Ask about our many other recreational and home applications!
TO ORDER: VISA/MasterCard, check or money order accepted. If charge, please include expiration date of card. Add $1.50 for shipping and handling. Calif. residents add sales tax.

CIRCLE 139 ON READER SERVICE CARD

memory display list, it checks location 106 to see where RAM ends. It then backs up the required number of locations and puts the display memory in. Thus 106 can be thought of as a "fence," that is used to find the end of memory.

Now let's assume we POKE 106, PEEK (106)-4. This will move the end-of-memory fence back four pages. Each page, you will recall, is 256 bytes, so that's 4 x 256 or 1024 bytes moved back. We then re-execute a graphics command, so the Atari will move the display memory display list out of that 1024-byte area, behind its fence. (See Diagram 6.) In this way we reserve 1024 bytes of memory starting on a page border.

There are several advantages of getting 1024 bytes this way. It doesn't matter what size memory your machine has, as long as the minimum 1024 bytes are available. Nor does it matter how long your Basic program is or what graphics mode you are in. You can see it is quite a handy general purpose thing to have.

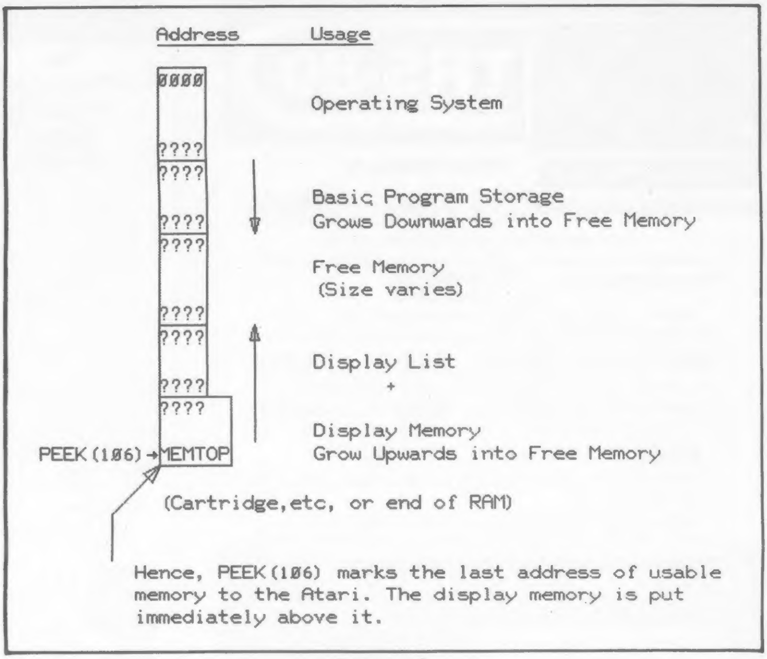
This is also the preferred technique to use when reserving memory for the Player-Missile bitmap area. Eight pages are required for a 2048-byte bitmap (single line resolution) or four for 1024 bytes (double line resolution). You will see this byte 106 modification in most Player-Missile articles.

One warning note: Basic cannot handle setting up a display list and display memory for graphics modes 7 and 8 in all cases when you modify the 106 pointer by less than 4K at a time. This means graphics 8 will produce truly bizarre results if you use PEEK(106)-8. Use a minimum of 4K change, or PEEK(106)-16. This may explain the problems some people have using Player-Missile graphics with high resolution graphics modes.

Copying the Character Set

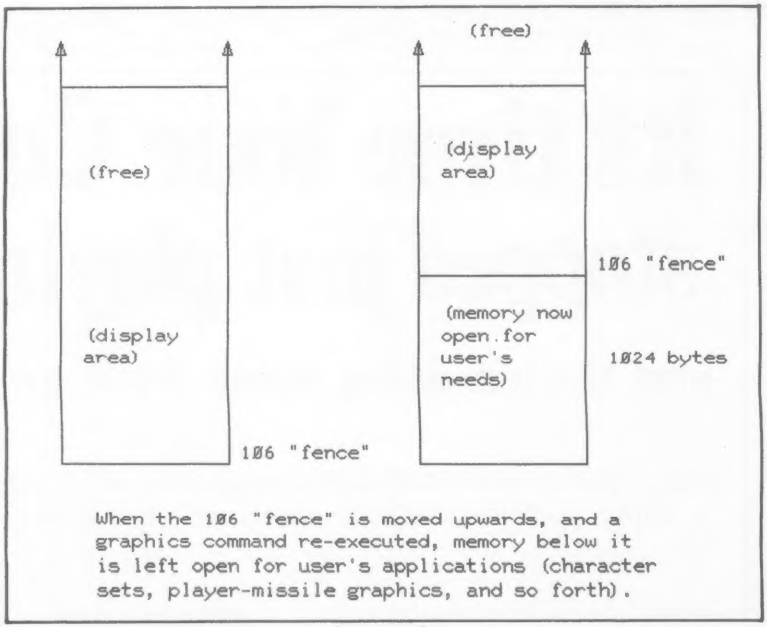
We now know the beginning of the RAM area, and where the ROM character set starts (E000 hex or 57344 decimal). Let's use Program 3 to copy the ROM character set to RAM. This program moves the 106 pointer back four pages and copies the character set over. It takes a while—around ten seconds to copy 1024 bytes—but later we will see a better way to do this.

Finally, the CHBAS pointer is changed to reflect the page of the beginning of RAM. Antic is now using the RAM character set. (See Diagram 7.)



Hence, PEEK(106) marks the last address of usable memory to the Atari. The display memory is put immediately above it.

Diagram 5.



When the 106 "fence" is moved upwards, and a graphics command re-executed, memory below it is left open for user's applications (character sets, player-missile graphics, and so forth).

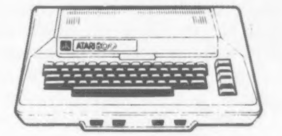
Diagram 6.

Now Program 3 doesn't show you much, for Antic will still be displaying characters as usual. So, let's watch the copy process in action. This time we will move the character set pointer *first*, then do the copy. Your screen will then display whatever junk is in memory at the start of the copy as the pointer is changed, then more and more letters will appear as Basic copies character shapes into the RAM table. At the end of the copy, the screen will once again appear normal. (See Program 4.)

Program 5 represents an interesting variation. It copies characters from ROM to RAM upside down. It does this by copying the eighth byte of every character into the first byte of the new bitmap for that character, the seventh to the second, and so forth. The result is that the new RAM bitmap is an inverted image of the ROM bitmap. This is fun; the characters

ATARI®

Computers for people.™



800™ $749

410 Recorder	$59.00
810 Disc Drive	$444.00
822 Printer	$359.00
825 Printer	$629.00
830 Modem	$159.00
820 Printer	$269.00
850 Interface	$159.00
New DOS 2 System	$21.00
CX70 Light Pen	$64.00
CX30 Paddle	$18.00
CX40 Joy Stick	$18.00
CX853 16K RAM	$89.00
Microtek 16K RAM	$75.00
Microtek 32K RAM	$169.00

400™ $329

ATARI SOFTWARE

CX404 Word Processor	$119.00
CX404 PILQT	$68.00
CX413 Microsoft Basic	$68.00
CX4101 Invitation To Programing I	$17.00
CX4102 Kingdom	$13.00
CX4103 Statistics	$17.00
CX4104 Mialing List	$17.00
CX4105 Blackjack	$13.00
CX4106 Invitation to Programing 2	$20.00
CX4107 Biorythm	$13.00
CX4108 Hangman	$13.00
CX4109 Graph It	$17.00
CX4110 Touch Typing	$20.00
CX4111 SPACE INVADERS	$17.00
CX4112 States & Capitals	$13.00
CX4114 European Countries & Capitals	$13.00
CX4115 Mortgage & Loan Analysis	$13.00
CX4116 Personal Fitness Program	$59.00
CX4117 Invitation To Programing 3	$20.00
CX4118-20 Conversational Languages (ea.)	$45.00
CX4121 Energy Czar	$13.00
CXL4001 Educational Master	$21.00
CX6001-17 Talk & Teach Series (ea.)	$23.00
CX8106 Bond Analysis	$20.00
CX8107 Stock Analysis	$20.00
CX8101 Stock Charting	$20.00
CXL4002 Basic Computing Language	$46.00
CXL4003 Assembler Editor	$46.00
CXL4004 Basketball	$24.00
CXL4005 Video Easel	$24.00
CXL4006 Super Breakout	$30.00
CXL4007 Music Composer	$45.00
CXL4009 Chess	$30.00
CXL4010 3-D Tic-Tac-Toe	$24.00
CLS4011 STAR RAIDERS	$39.00
CXL4012 MISSLE COMMAND	$32.00
CXL4013 ASTEROIDS	$32.00
CXL4015 TeleLink	$20.00
Visicalc	$149.00
Letter Perfect (Word Processor)	$109.00
Source	$89.00

commodore

CBM 8032 $1149

4016	$799.00
4032	$999.99
8096	$1795.00
CBM4022 Printer	$629.00
Tally 8024	$1699.00
CBM C2N Cassette Drive	$69.00
CBM4040 Dual Disk Drive	$1039.00
CBM8050 Dual Disk Drive	$1349.00

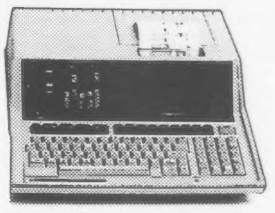
SOFTWARE

WordPro3 Plus	$229.00
WordPro4 Plus	$329.00
Commodore Tax Package	$399.00
Visicalc	$149.00
BPI General Ledger	$329.00
OZZ Information System	$329.00
Dow Jones Portfolio	$129.00
Pascal	$239.00
Legal Time Accounting	$449.00
Word Craft 80	$289.00
Create-A-Base	$249.00
Power	$89.00
Socket-2-Me	$20.00
Jinsam	$Call
MAGIC	$ Call

VIC 20 $259

Vic-TV Modual	$19.00
Vic Cassette	$69.00
Vic 6 Pack Program	$44.00
VIC1530 Commodore Datassette	$69.00
VIC1540 Disk Drive	$499.00
VIC1515 VIC Graphic Printer	$399.00
VIC1210 3K Memory Expander	$32.00
VIC1110 8K Memory Expander	$53.00
VIC1011 RS232C Terminal Interface	$43.00
VIC1112 VIC IEEE-488 Interface	$86.00
VIC1211 VIC 20 Super Expander	$53.00
VIC1212 Programmers Aid Cartridge	$45.00
VIC1213 VICMON Machine Language Monitor	$45.00
VIC1901 VIC AVENGERS	$23.00
VIC1904 SUPERSLOT	$23.00
VIC1906 SUPER ALIEN	$19.00
VIC1907 SUPER LANDER	$23.00
VIC1908 DRAW POKER	$23.00
VIC1909 MIDNIGHT DRIVE	$23.00
VT106A Recreation Pack A	$44.00
VT107A Home Calculation Pack A	$44.00
VT164 Programmable Character/Gramegraphics	$12.0o
VT232 VICTerm I Terminal Emulator	[illegible].00

HEWLETT PACKARD

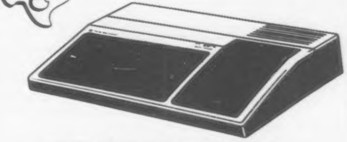


HP•85 $2595

NEW! HP•125	$3295.00
HP•83	$1795.00
HP•85 16K Memory Module	$249.00
5¼" Dual Master Disc Drive	$2129.00
Graphics Plotter (7225B)	$2079.00

Call for HP Software Prices & Information.
Call for Calculator prices.

Texas Instruments



TI-99/4 $399

PHC 004 TI-99/4 Home Computer	$399.00
PHP 1600 Telephone Coupler	$169.00
PHP 1700 RS-232 Accessories Interface	$169.00
PHP 1800 Disk Drive Controller	$239.00
PHP 1850 Disk Memory Drive	$389.00
PHP 2200 Memory Expansion (32K RAM)	$239.00
PHA 2100 R.F. Modulator	$43.00
PHP 1100 Wired Remote Controllers(Pair)	$31.00
PHM 3006 Home Financial Decisions	$26.00
PHM 3013 Personal Record Keeping	$43.00
PHD 5001 Mailing List	$60.00
PHD 5021 Checkbook Manager	$18.00
PHM 3008 Video Chess	$60.00
PHM 3010 Physical Fitness	$26.00
PHM 3009 Football	$26.00
PHM 3018 Video Games I	$26.00
PHM 3024 Indoor Soccer	$26.00
PHM 3025 Mind Challengers	$22.00
PHM 3031 The Attack	$35.00
PHM 3032 Blasto	$22.00
PHM 3033 Blackjack and Poker	$22.00
PHM 3034 Hustle	$22.00
PHM.3036 Zero Zap	$18.00
PHM 3037 Hangman	$18.00
PHM 3038 Connect Four	$18.00
PHM 3039 Yahtzee	$22.00
PHM 3017 Terminal Emulator I	$39.00
PHM 3026 Extended Basic	$88.00
PHM 3035 Terminal Emulator II	$45.00

DISCS

Sycom Blank Disk (10)	$29.00
Maxell MD I	$36.00
Maxell MD II (10)	$46.00

PRINTERS

Epson MX-70	Call for Prices
Epson MX-80	
Epson MX-80 FT	
Diablo 630	
TEC 1500 Starwriter 25cps	$1495.00
TEC 1500 Starwriter 45cps	$1795.00

No Risk, No Deposit On Phone Orders, COD or Credit Card, Shipped Same Day You Call *

* on all in stock units

(800) 233-8950

IN PA, CALL (717) 327-9575

COMPUTER MAIL ORDER

501 E. THIRD ST., WILLIAMSPORT, PA 17701

OVER 40 YEARS EXPERIENCE
IN SOPHISITICATED ELECTRONICS

To Order:

Phone orders invited (800 number is for order desk only). Or send check or money order and receive free shipping. Pennsylvania residents add 6% sales tax. Add 3% for Visa or M.C. Equipment is subject to price change and availability without notice. Please call between 11 AM & 6 PM.

CIRCLE 148 ON READER SERVICE CARD

are still onscreen, and you can edit and so forth, but they are upside down. (See Diagram 8.)

```
50 REM PROGRAM 3
60 REM COPIES CHARSET TO RAM
100 MEMTOP=PEEK( 106 )
110 GRTOP=MEMTOP-4
120 POKE 106,GRTOP
130 REM RESET
140 GRAPHICS 0
141 LIST
160 CHROM=PEEK( 756 )*256
170 CHRAM=GRTOP*256
180 PRINT "COPYING."
500 FOR N=0 TO 1023
510 POKE CHRAM+N,PEEK( CHROM+N )
520 NEXT N
530 PRINT "COPIED."
535 REM NOW MODIFY POINTER
540 POKE 756,GRTOP
```

Program 3.

```
50 REM PROGRAM'4
60 REM COPIES CHARSET TO RAM
100 MEMTOP=PEEK( 106 )
110 GRTOP=MEMTOP-4
120 POKE 106,GRTOP
130 REM'RESET
140 GRAPHICS 0
141 LIST
160 CHROM=PEEK( 756 )*256
170 CHRAM=GRTOP*256
172 REM NOW MODIFY POINTER
173 POKE 756,GRTOP
180 PRINT "COPYING."
500 FOR N=0 TO 1023
510 POKE CHRAM+N,PEEK( CHROM+N )
520 NEXT N
530 PRINT "COPIED."
```

Program 4.

Program 6 shows yet another useful variation. It makes the last byte of every character a 255, or solid 1's. This puts a solid line at the base of the characters, and creates a line at the bottom of each of the 24 character rows—a nifty effect.

Program 7 illustrates another handy character set feature. We can POKE different values into the CHBAS pointer and thus switch between multiple character sets immediately. In Program 7 we have two character sets, one normal, one flipped upside down. The program switches between them rapidly for an effect that is hard on the eyes. Assembly language programmers take note: with a display list interrupt, you can change character sets midway down the screen. The possibilities are amazing. Just POKE a new value into the Antic hardware address for CHBAS.

Changing a Character

Now let's assume we have decided to change a ROM character set character to a custom one. Let's work it out by hand the first time. Incidentally, an editor based on this hand working out is none too difficult to write and there are many more on the market. None, however, has the storage scheme I'm going to explain which is so convenient.

First, let's design the character we want as an 8 x 8 dot matrix. (See Diagram 9.)

This is, of course, the character from the "Have a Nice Day!" button.

Next, let's determine the bit patterns. You can do this by converting to hex each nibble (four bits), and then going to decimal (as I do), or by adding the number shown on the top of the column to the total for that line whenever the dot it represents is on. For example, in the diagram, 16 and 18 are on, so add 16+8 =24.

At the end of this process, you will have 8 bytes of data which represent the bitmap for that character. Next, let's figure out which character we will replace with our character. How about the space character? There are plenty of those onscreen. OK, the space character is the first one in the ROM-RAM character set—character #0, in internal code. So what we do is to POKE these eight bytes into the location where the bitmap of the space character is located, replacing it with the "smile" character. See Program 8, which is our copy-the-character-set-from-ROM-to-RAM routine with the added POKEs. (The numbers are in the DATA statement.)

If we wanted to replace another character we would multiply its character number by 8, add it to the start of the

MICRO PRO MICROSOFT MUSE ON-LINE PERSONAL PICCADILLY PHOENIX QUALITY

STOP

APPLE . . . APPLE . . . APPLE . . . APPLE

STOP

if you didn't buy from CPI . . . you paid too much!

We'll meet any nationally advertised software prices even 45 days after your order. (Just send a copy of the ad.)

LOWEST SOFTWARE PRICES-We won't be undersold.

Adventure Time

ADVENTURE INTERNATIONAL		
Adventure #1, 2, 3,	d	32.00
Adventure #4, 5, 6	d	32.00
Adventure #7, 8, 9	d	32.00
Adventure #10, 11, 12	d	32.00
Stone of Sisyphus	d	24.00
Kid Adventure #1	c	12.00
Adv. Hint Book	d	6.50
EDU-WARE		
The Prisoner	d	24.00
Terrorist	d	24.00
HIGHLANDS COMPUTER		
Oldorf's Revenge	d	16.00
Tarturian	d	20.00
Creature Venture	d	20.00
ON-LINE SYSTEMS		
Hi-Res Adv. #0	d	16.00
Hi-Res Adv. #1	d	20.00
Hi-Res Adv. #2	d	26.50
Hi-Res Adv. #3	d	28.00
Softporn Adv. (x-rated)	d	24.00
PERSONAL SOFTWARE		
Zork	d	34.00
Gammon Gambler	d	21.00
Monty-Monopoly	d	29.00
Monty-Scrabble	d	29.00
Micro Chess	d	21.00
Bridge Partner	d	21.00

Apples = BUSINESS

CONTINENTAL SOFTWARE		
#1 General Ledger	d	200.00
#2 Accts. Rec.	d	200.00
#3 Accts. Pay.	d	200.00
#4 Payroll	d	200.00
DENVER SOFTWARE		
Financial Partner	d	140.00
HOWARD SOFTWARE		
Tax Preparer	d	80.00
Real Estate Analyzer	d	120.00
Creative Financing	d	120.00
PERSONAL SOFTWARE		
Desk Top Plan II	d	166.00
Visicalc 3.3	d	166.00
Visiplot	d	151.00
Visitrend / Visiplot	d	219.00
Visidex	d	166.00
Visiterm	d	127.00
SOFTWARE PUBLISHING		
PFS (Filing Sys)	d	76.00
PFS: Report	d	76.00
MICRO PRO (CP/M)		
Spell Sort I	d	195.00
Word Star	d	290.00
Data Star	d	290.00
Mall Merge	d	95.00

**Requires Z80-SOFTCARD.*

Programmer Helpers

DENVER SOFTWARE		
Pascal Programmer	d	100.00
Pascal Tutor	d	100.00
HAYDEN SOFTWARE		
Assembly Dev. Sys.	d	32.00
Applesoft Compiler	d	160.00
IUS		
FORTH Dev. Sys	d	112.00
MICROSOFT		
Fortran-80	d	156.00
A.L.D.S.	d	100.00
Basic Compiler	d	316.00
Cobol-80	d	600.00
SOFT Card	d	335.00
RAM Card	d	165.00
Olympic Decathlon	d	24.00
SYNERGISTIC SOFTWARE		
Prog. Line Editor	d	32.00
Higher Fonts	d	12.00
Higher Text II	d	32.00
Higher Graphics	d	28.00
Prog. Line Editor (ROM)		48.00
STONEWARE		
DB Master	d	184.00
SENSIBLE SOFTWARE		
Super Disk Copy III	d	24.00
Multi-Disk Catalog	d	20.00

ARCADE in the Home

BRODERBUND SOFTWARE		
Apple Panic	d	24.00
Space Warrior	d	20.00
Snoggle (Joystick)	d	26.50
BUDGECO		
Raster Blaster	d	24.00
CAVALIER COMPUTER		
Astroid Field	d	20.00
Star Thief	d	24.00
INNOVATIVE DESIGN		
Pool 1.5	d	28.00
Shuffleboard	d	24.00
MUSE		
3 Mile Island	d	32.00
A.B.M.	d	20.00
Robot War	d	32.00
SENTIENT SOFTWARE		
Oo-Topus	d	26.50
SIRIUS SOFTWARE		
Space Eggs	d	24.00
Autobahn	d	24.00
Gamma Goblins	d	24.00
Gorgon	d	32.00
Sneakers	d	24.00
STRATEGIC SIMULATIONS		
Warp Factor	d	32.00
Computer Baseball	d	32.00

Didn't find it? Send for a Catalog of over 800 items. (incl. ATARI, PET & TRS-80)

Prices subject to change without notice. All products fully guaranteed.

To insure correct shipment, indicate computer make/model and if you desire disk or cassette. Personal checks accepted, please allow 14 days for processing. For faster service, make payment by: Money Order, Cashier Check, C.O.D., Master Charge or VISA Card. For charge card indicate card type and date, expiration date and phone number. California residents add 6% sales tax. Include $2.50 shipping charge per order.

VISA

CPI

Computer Products International
P.O. Box 56
Arcadia, California 91006

ADVENTURE INTERNATIONAL ASTAR ARTSCI AUTOMATED SIMULATIONS AVALON HILL BRODERBUND

CAVALIER CONTEXT CONTINENTAL DATAMOST DATASOFT DELTA DENVER EDU-WARE HAYDEN HIGHLANDS HOWARDSOFT

CIRCLE 222 ON READER SERVICE CARD

MALA
Educational
Computer
Subscription
Program

PET COMMODORE VIC

32 programs
$48

COMPUTER GAMES

FREE
Educational Catalog
Summary Available

COMM*DATA
SYSTEMS, INC.
P.O. BOX 325
MILFORD, MICHIGAN 48042
[313] 685-0113

CIRCLE 126 ON READER SERVICE CARD

APPLE II® SOFTWARE
® Registered Trademark of Apple Computer, Inc.

Can it benefit others?

Is it yours?

We sell quality educational software — that runs on the Apple II computer — addressing science, math, language arts, skills …

Our buyers? Schools — elementary, secondary and college level. Plus over 100 computer stores and audio/visual dealers. Plus Bell & Howell Ltd., marketing throughout Canada.

Our exposure? Advertising in a number of national publications — computer, business and educational.

Our interest? The opportunity to evaluate your courseware, with an eye to making you an outright purchase or outstanding royalty offer.

Are you interested? If so, contact:

12820 Hillcrest Rd. #224
Dallas, Texas 75230
214/239-6620

MICRO POWER & LIGHT CO.

CIRCLE 189 ON READER SERVICE CARD

TERMINALS FROM TRANSNET

PURCHASE PLAN • 12-24 MONTH FULL OWNERSHIP PLAN • 36 MONTH LEASE PLAN

	DESCRIPTION	PURCHASE PRICE	PER MONTH 12 MOS.	24 MOS.	36 MOS.
DEC	LA36 DECwriter II	$1,095	$105	$ 58	$ 40
	LA34 DECwriter IV	995	95	53	36
	LA34 DECwriter IV Forms Ctrl.	1,095	105	58	40
	LA120 DECwriter III KSR	2,295	220	122	83
	LA120 DECwriter III RO	2,095	200	112	75
	VT100 CRT DECscope	1,695	162	90	61
	VT101 CRT DECscope	1,195	115	67	43
	VT125 CRT Graphics	3,295	315	185	119
	VT131 CRT DECscope	1,745	167	98	63
	VT132 CRT DECscope	1,995	190	106	72
TEXAS INSTRUMENTS	TI745 Portable Terminal	1,595	153	85	58
	TI765 Bubble Memory Terminal	2,595	249	138	93
	TI Insight 10 Terminal	695	67	37	25
	TI785 Portable KSR, 120 CPS.	2,395	230	128	86
	TI787 Portable KSR, 120 CPS	2,845	273	152	102
	TI810 RO Printer	1,695	162	90	61
	TI820 KSR Printer	2,195	211	117	80
LEAR SIEGLER	ADM3A CRT Terminal	595	57	34	22
	ADM5 CRT Terminal	645	62	36	24
	ADM32 CRT Terminal	1,165	112	65	42
	ADM42 CRT Terminal	1,995	190	106	72
DATAMEDIA	DT80/1 CRT Terminal	1,695	162	90	61
	DT80/3 CRT Terminal	1,295	125	70	48
	DT80/5L APL 15" CRT	2,295	220	122	83
TELEVIDEO	920 CRT Terminal	895	86	48	32
	950 CRT Terminal	1,075	103	57	39
NEC SPINWRITER	Letter Quality, 7715 RO	2,895	278	154	104
	Letter Quality, 7725 KSR	3,295	316	175	119
GENERAL ELECTRIC	2030 KSR Printer 30 CPS	1,195	115	67	43
	2120 KSR Printer 120 CPS	2,195	211	117	80
HAZELTINE	Executive 80/20	1,345	127	75	49
	Executive 80/30	1,695	162	90	61
EPSON	MX-80 F/T Printer	650	62	37	24
	MX-100 Printer	895	86	48	32

FULL OWNERSHIP AFTER 12 OR 24 MONTHS • 10% PURCHASE OPTION AFTER 36 MONTHS

MICROCOMPUTERS
APPLE • COMMODORE • HP85 • DEC LSI 11

ACCESSORIES AND PERIPHERAL EQUIPMENT
ACOUSTIC COUPLERS • MODEMS • THERMAL PAPER • RIBBONS • INTERFACE MODULES • FLOPPY DISK UNITS

TRANSNET CORPORATION
1945 ROUTE 22 • UNION, N.J. 07083 • (201) 688-7800
TWX 710-985-5485

CIRCLE 181 ON READER SERVICE CARD

COMPUTER EQUIPMENT & SOFTWARE BARGAINS

COMPUTER SHOPPER
The Nationwide Marketplace for Computer Equipment
Get Your First Issue FREE!
TRS-80's at Super Discount Prices

EVERY MONTH

BUY, SELL OR TRADE ALL TYPES OF COMPUTER EQUIPMENT AND SOFTWARE (pre-owned and new) among 20,000 readers nationwide.

FEATURES:

- Low classified ad rates - 12¢ a word
- Hundreds of ads from individuals
- Categorized ads so you can find them instantly
- Large (11 by 14") easy to read pages

Subscribe now for $10 and receive 13 issues/year (one FREE plus 12 regular issues). After receiving your first issue if you're not completely satisfied you may have a 100% refund and you still keep the first issue free. Bank cards accepted.

BONUS: *If you have something to advertise (pre-owned or software) send in a classified ad with your subscription and we'll run it FREE.*

The Nationwide Marketplace for Computer Equipment
COMPUTER SHOPPER
P.O. BOX F7 • TITUSVILLE, FL 32780 • 305-269-3211
MasterCard & VISA subscriptions only, call **TOLL FREE** 1-800-327-9920

CIRCLE 128 ON READER SERVICE CARD

Western Micro Distributors

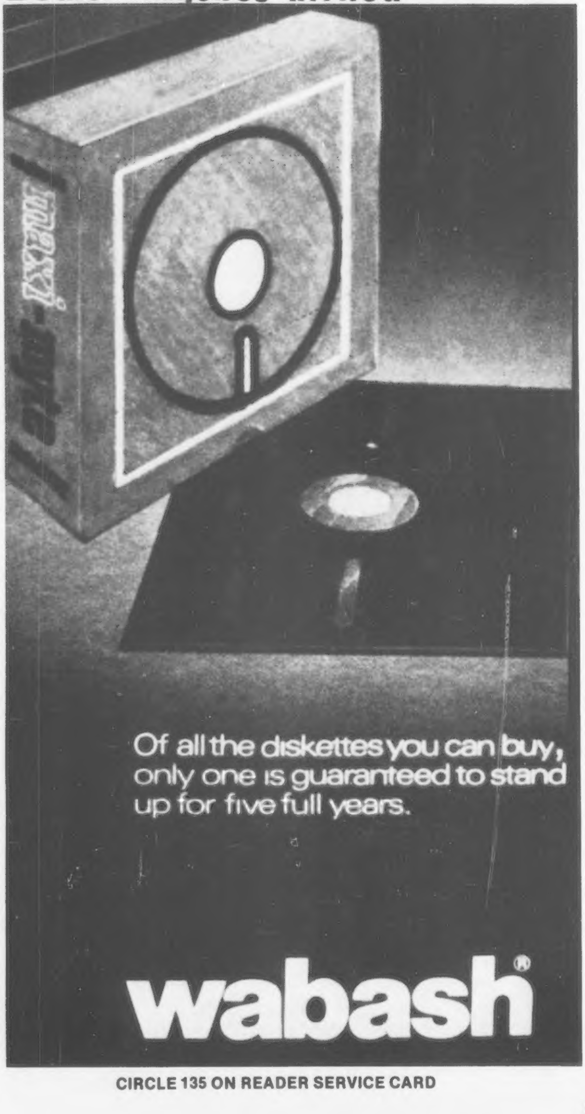
Authorized Wabash Distributor

17955 SKY PARK CIRCLE SUITE "E"
IRVINE, CALIFORNIA 92714

(714) 937-0121 or 557-1290

	5¼	8inch	
SS/SD	$25.95	$25.95	
SS/DD	28.50	30.50	"BOX OF TEN"
DS/DD	33.50	33.95	

Dealer Inquires Invited


Of all the diskettes you can buy, only one is guaranteed to stand up for five full years.
wabash®

CIRCLE 135 ON READER SERVICE CARD

Atari, continued...

```
40 REM PROGRAM 5. COPIES UPSIDE DOWN.
50 REM COPY CHARSET UPSIDE DOWN
100 MEMTOP=PEEK( 106 )
110 GRTOP=MEMTOP-4
115 CLOC=GRTOP
120 POKE 106,GRTOP
130 REM RESET GR.0 DM/DL AREA
140 GRAPHICS 0
141 LIST
150 CH=756
160 CHROM=PEEK( CH )*256
170 CHRAM=GRTOP*256
175 PRINT "CHRAM=";CHRAM;"  CHROM=";CHROM
180 PRINT "COPYING."
190 REM COPY ROM TO RAM
300 POKE CH,CLOC
500 FOR N=0 TO 1023
510 POKE CHRAM+N,PEEK( CHROM+N )
520 NEXT N
530 PRINT "COPIED."
550 REM  NOW COPY UPSIDE DOWN
600 FOR CHNUM=0 TO 127
610 FOR BYTE=0 TO 7
615 Z=PEEK( CHROM+( CHNUM*8 )+BYTE )
620 POKE ( CHNUM*8 )+( CHRAM )+( 7-BYTE ),Z
630 NEXT BYTE
635 NEXT CHNUM
640 PRINT "RECOPIED."
```

Program 5.

```
40 REM PROGRAM 6. UNDERLINES CHARS.
100 MEMTOP=PEEK( 106 )
110 GRTOP=MEMTOP-4
115 CLOC=GRTOP
120 POKE 106,GRTOP
130 REM RESET GR.0 DM/DL AREA
140 GRAPHICS 0
141 LIST
150 CH=756
160 CHROM=PEEK( CH )*256
170 CHRAM=GRTOP*256
175 PRINT "CHRAM=";CHRAM;"  CHROM=";CHROM
180 POKE CH,GRTOP
600 FOR CHNUM=0 TO 127
610 FOR BYTE=0 TO 7
615 Z=PEEK( CHROM+( CHNUM*8 )+BYTE )
616 IF 3YTE=7 THEN LET Z=255
620 POKE ( CHNUM*8 )+( CHRAM )+( BYTE ),Z
630 NEXT BYTE
635 NEXT CHNUM
640 PRINT "RECOPIED."
```

Program 6.

```
40 REM PROGRAM 7. COPIES UPSIDE DOWN.
45 REM THEN FLIPS BACK AND FORTH
100 MEMTOP=PEEK( 106 )
110 GRTOP=MEMTOP-4
115 CLOC=GRTOP
120 POKE 106,GRTOP
130 REM RESET GR.0 DM/DL AREA
140 GRAPHICS 0
141 LIST
150 CH=756
160 CHROM=PEEK( CH )*256
170 CHRAM=GRTOP*256
175 PRINT "CHRAM=";CHRAM;"  CHROM=";CHROM
180 PRINT "COPYING."
190 REM COPY ROM TO RAM
300 POKE CH,CLOC
500 FOR N=0 TO 1023
510 POKE CHRAM+N,PEEK( CHROM+N )
520 NEXT N
530 PRINT "COPIED."
550 REM  NOW COPY UPSIDE DOWN
600 FOR CHNUM=0 TO 127
610 FOR BYTE=0 TO 7
615 Z=PEEK( CHROM+( CHNUM*8 )+BYTE )
620 POKE ( CHNUM*8 )+( CHRAM )+( 7-BYTE ),Z
630 NEXT BYTE
635 NEXT CHNUM
640 PRINT "RECOPIED."
700 REM FLIP
710 POKE CH,224:REM NORMAL ROM
720 POKE CH,CLOC
730 GOTO 710
```

Program 7.

Roy Hicks, Owner
DESIGNER/ELECTRONIC ENGINEER

R.H. ELECTRONICS

COMPUTER PRODUCTS

APPLE* OWNERS

SUPER RAM•II

FOR YOUR APPLE II COMPUTER* $160

- PLUG IN SLOT 0
- GOLD PLATED CONTACTS
- INCLUDES 5 RAM-ROM OPTIONS
- THIS IS SOPHISTICATED FIRMWARE
- ENJOY THE BEST OF BOTH WORLDS
- 16K RAM (RANDOM ACCESS MEMORY)
- INCLUDES SELECTABLE DIP SWITCH
- EXPANDS YOUR 48K APPLE TO 64K OF PROGRAMMABLE MEMORY
- ELIMINATES THE NEED FOR APPLESOFT* OR INTEGER BASIC ROM CARD
- ALLOWS YOU TO RUN APPLE'S NEW FORTRAN PACKAGE ALSO PASCAL AND PILOT—CP/M* · COBOL · INTEGER/BASIC · APPLESOFT/BASIC · VISICALC · DOS 3.3
- KEYBOARD CONTROL SELECTION OF RAM OR MOTHER BOARD ROM LANGUAGE
- INCLUDES: INSTALLATION INSTRUCTIONS AND APPLICATIONS NOTES
- THE SOFTWARE DEVELOPED BY VARIOUS VENDORS FOR YOUR (64K) SHOULD NOW WORK AS THEY ADVERTISED
- THE MOST VERSATILE RAM EXPANSION ON THE MARKET TODAY
- ROM SOCKET LET'S YOU CREATE YOUR OWN SPECIAL USES—DESIGN YOUR OWN SOFTWARE PROGRAMS
- LOCKS IN SOFTWARE PROGRAMS SO THEY CAN'T BE COPIED

UNIQUE 1 YEAR WARRANTY!

"When a better product is made, we'll be the ones to make it!"

FOR FAST SERVICE SEND CASHIERS CHECK OR MONEY ORDER—PERSONAL CHECKS TAKE 3 WEEKS TO CLEAR. **SHIPPED ANYWHERE IN THE U.S.A.**

COMPUTER PRODUCTS
ROY HICKS, Owner
R.H. ELECTRONICS
566 Irelan - Bin CC
Buellton, CA 93427
TECHNICAL SUPPORT (805) 688-2047

SUPER RAM II - $160.00*
SUPER FAN II - $69.00*

*SALES TAX: California Residents add 6%
SHIPPING: Add $2.50 per item
C.O.D.: Add $1.40 per item

*APPLE II COMPUTER and APPLESOFT are trademarks of Apple Computer Inc

CIRCLE 327 ON READER SERVICE CARD

Riverbank Software Inc.

PROUDLY INTRODUCES

INTERNATIONAL GRAN PRIX

an arcade-like race car simulation
by RICHARD ORBAN
author of THREE MILE ISLAND*

REQUIRES APPLE II★★ OR APPLE II PLUS★★ 48K, 13 OR 16 SECTOR DISK, PADDLE CONTROL

01:40 01:40.
LAP TIME
RACE TIME
1 1 000

$30.00 PER DISK
MD. RESIDENTS ADD 5%
U.S. CURRENCY ONLY

See your local dealer

VISA/MASTERCHARGE
MONEY ORDERS/COD
DEALER/DISTRIBUTOR
INQUIRIES INVITED

INQUIRIES AND
ORDERS: 301-479-1312
SMITH'S LANDING ROAD
POST OFFICE BOX 128
DENTON, MD. 21629

● SPECIAL FEATURES ●

Five GRAND PRIX-style road circuits, including: Oulton Park, Warwick Farm, Karlskoga, and Monaco ● Five speed manual or automatic transmission (with or without cruise control) ● Eight levels of difficulty.

● ADDITIONAL FEATURES ●

Speeds to 198 MPH ● controlled skids ● spinouts ● spectacular crashes ● hair pin turns ● narrow corners ● obstacles ● identified circuit features ● number of laps selection ● flashing last lap indicator ● 'Christmas tree' controlled start ● switch for silent operation ● blue post marks 300' intervals ● best lap/best race times posted ● fully instrumented control panel: lap timer ● race timer ● indicator lights ● edge detectors ● position indicator ● steering indicator ● moving speed tape ● lap counter ● gear and RPM indicators ● operating fuel gauge

RIVERBANK WILL REPLACE DAMAGED DISKS WITHIN 1 YEAR OF PURCHASE. RETURN DISK WITH PROOF OF PURCHASE PLUS FIVE DOLLARS POSTAGE AND HANDLING FOR IMMEDIATE REPLACEMENT (TEN DOLLARS OVERSEAS)

*TRADEMARK MUSE CO., BALT. MD. ★★APPLE COMPUTER, INC., CUPERTINO, CA.

CIRCLE 303 ON READER SERVICE CARD

SEND FOR OUR FREE CATALOGUE!!

Page after page of hardware and software products for your Apple®, Atari® or TRS-80®. Hundreds of products offered at low, low SALE prices. Write or phone today and SAVE!!

HOLIDAY SPECIALS

BUY ANY 2 PROGRAMS-TAKE 5% OFF!
BUY 3 OR MORE-TAKE 10% OFF

FOR THE APPLE II(tm)

ROBOTWAR - from Muse Software
Cat No. 3206 Apple II/II+, 48K, Aplsft ROM, disk **$37.95**

APPLE PANIC - from Broderbund
Cat No. 3204 Apple II/II+ 48K, disk **$28.95**

EPOC - from Sirius Software
Cat No. 3208 Apple II/II+ 48K, disk **$33.95**

FOR THE ATARI(tm) COMPUTER

JAWBREAKER - from On-Line Systems
Cat No. 3217 Atari, 24K, disk **$28.95**

STAR BASE HYPERION Quality Software
Cat No. 3224 Atari, 24K, cassette **$19.95**
Cat No. 3225 Atari, 32K, disk **$21.95**

SURVIVAL/ADVENTURE - USA Software
Cat No. 3218 Atari, 32K, cassette
Cat No. 3219 Atari, 32K, disk **$24.95**

STATES & CAPITALS
Cat. No. 3254 Atari, 16K, casette
EUROPEAN COUNTRIES & CAPITALS **$27.95**
Cat. No. 3255 Atari, 16K, cassette

MAR TESORO **SYNCHRO**
A unique sea adventure.
Cat. No. 3267 Atari, 24K, cass, JOYSTICK **$16.95**
Cat. No. 3268 Atari, 32K, disk, JOYSTICK **$21.97**

HOW TO ORDER

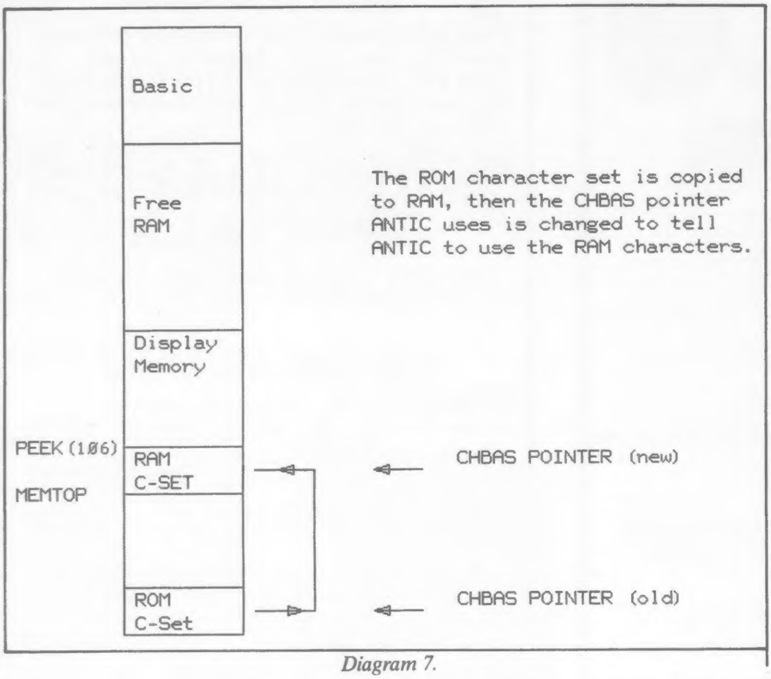
Mention this ad and WE PAY SHIPPING & HANDLING (UPS ground, USA only). Write or phone. Pay by Check, M/C, Visa, or COD. (Add $1.40 addl. for COD) Offer expires Jan. 1, 1982. 19511 Business Center Dr., Dept. C1 Northridge, CA 91324
(800) 423-5387 (Outside Calif.)
(213) 886-9200 (In Calf.)

HW ELECTRONICS

WHEN IN SOUTHERN CALIFORNIA, VISIT OUR RETAIL STORES

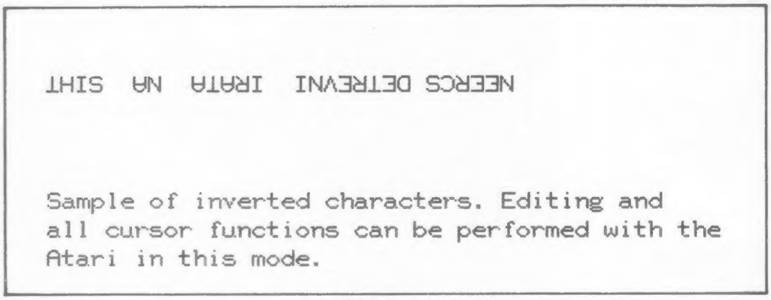
HW COMPUTERS
19511 BUSINESS CENTER DR.
NORTHRIDGE, CA 91324

2301 ARTESIA BLVD.
REDONDO BEACH, CA 90277



The ROM character set is copied to RAM, then the CHBAS pointer ANTIC uses is changed to tell ANTIC to use the RAM characters.

Diagram 7.



THIS AN ATARI INVERTED SCREEN

Sample of inverted characters. Editing and all cursor functions can be performed with the Atari in this mode.

Diagram 8.

address of the character set and start POKEing there. That's why I added the LOC=(CHBAS + (8*0)), which at first seems nonsensical. Replace the 0 with whatever number you wish.

At this point your Atari will be smiling proudly. Take a minute and enjoy its happiness at your success.

Storing and Retrieving Your Character Set

You don't want to have to re-POKE your character set each time you want to use it. And let's face it, the POKE method of copying the 1024 bytes from ROM to RAM is incredibly slow. Let's solve these problems with some custom routines. They all work with string manipulations, which I'm rapidly beginning to realize are extremely powerful and usable on the Atari. The reason for their power is their speed in an otherwise slow Basic; the string manipulation routines are just high speed assembly language copy routines. Let's subvert them for our purposes, and have assembly speed without all the hassles.

Each string is stored in memory as a continuous group of bytes. A string has a DIMensioned length, a "currently in use" length, and a location in memory. Let's say we have two strings, RAM$ and ROM$, and assume they both have length 1024. Assume also that the storage location where the Atari thinks RAM$ is in memory just happens to be our RAM character set area. (What a marvelous coincidence.) Let's further assume that ROM$ is in the ROM character set area (or so the Atari thinks.) What will happen then when we execute RAM$=ROM$?

The Basic string manipulation routines will copy 1024 bytes (dimensioned length) from ROM$ to RAM$, and thus copy the ROM character set to the RAM character set at extremely high speed!

Now let's modify the RAM character set. Bear in mind that you can do this with *either* a POKE or a string operator; when you modify the string, you're modifying the RAM character set. (It won't let you modify ROM$ for obvious reasons). Then let's write RAM$ out to disk. Fine, the Atari will store your character set on disk as a string. Next, let's read it back in, still using all string manipulation operators, and store it back into the character set area. You will have stored and recovered your character set. Nice, eh? No hassles with bits and bytes, just a PRINT to disk and an INPUT later on. (The details of reading and writing said string I'll leave to you; it's awfully easy).

Incidentally, the power of the copy capability is also usable in player-missile graphics. In the April 1981 "Outpost: Atari," George Blank assigned a string to the player bitmap area, and then moved the player up or down at high speed using a $=$. This is a nice, fast way to move a player vertically, which before required either assembly language or slow POKE copies. And strings may be used for data storage; the display list interrupt routine I wrote and documented not too long ago used a string to store data bytes for color registers, and another string to hold the assembly program used for the interrupt handling.

Let's learn how to change where the Atari thinks a string is located in memory. Then we'll get to the actual subroutines you can use.

The Atari keeps two tables in memory for Basic that deal with string variables. One is called the variable table, the other the array table. There are 128 possible variable names on the Atari, numbered 0-127, and the variable table has an 8-byte entry for each name in use. All the entries are packed together. For strings this entry has dimensioned and in-use length, and location in the array table in which the string is stored.

The other table is the array table, in which the actual data of the string is kept. So, what we have to do is alter the dimensioned and in-use length as shown in the variable table, both to 1024, then modify where the Atari thinks the variable is stored in the array table. The only tricky part of this is that the address of where the string is actually stored is relative to the array table; in other words, a 0 for this value doesn't mean the string starts at location 9, it starts at the beginning of the array table.

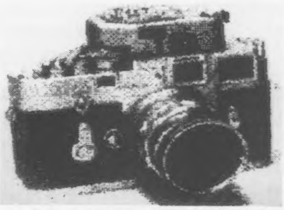
LET YOUR APPLE SEE THE WORLD!

The DS-65 Digisector® opens up a whole new world for your Apple II. Your computer can now be a part of the action, taking pictures to amuse your friends, watching your house while you're away, taking computer portraits . . . the applications abound! The DS-65 is a random access video digitizer. It converts a TV camera's output into digital information your computer can process. The DS-65 features:

- **High Resolution** — a 256 × 256 picture element scan
- **Precision** — 64 levels of grey scale
- **Versatility** — Accepts either NTSC or industrial video input
- **Economy** — A professional tool priced for the hobbyist

The DS-65 is an intelligent peripheral card with on-board software in 2708 EPROM. Check these software features:

- Full screen scans directly to Apple Hi-Res screen
- Easy random access digitizing by Basic programs
- Line-scan digitizing for reading charts or tracking objects
- Utility functions for clearing and copying the Hi-Res screen



HI-RES PICTURE USING THE DS-65 AND PICTURE SCANNER SOFTWARE

Use the DS-65 for precision security systems; computer portraiture; robotics; fast to slow scan conversion; moving target indicators; reading UPC codes, musical scores and paper tape and more! **GIVE YOUR APPLE THE GIFT OF SIGHT!** DS-65 Price: $349.95 / FSII Camera Price: $299.00 / Combination Price: $599.00

ADDITIONAL SOFTWARE FOR THE DS-65

—Picture Scanner: Provides a variety of different dithering algorithms for compressing the digitized image into the Hi-Res screen. Available on 13-sector disk. Price: $39.95

—Superscan: Enables you to enhance the DS-65's Hi-Res pictures with colors! Choose from 21 different colors and assign them to grey scale values, modify pictures, zoom, enhance contrast, etc. Print routines for the Anadex and Paper Tiger* are provided. Comes on a 13-sector disk. Written for The Micro Works by Magna Soft. Price: $79.95

—Portrait System Software: This program includes captions and a credit line, reverse printing for T-shirt application and the option to save portraits on disk. Specifically for use with a Malibu 165 printer. Call or write for more information.

*Paper Tiger is a trademark of Integral Data Systems, Inc.

MasterCharge/Visa Accepted

THE MICRO WORKS P.O. BOX 1110 DEL MAR, CA 92014 714-942-2400

CIRCLE 212 ON READER SERVICE CARD

SOFTWARE STREET
PRESENTS

ATARI

SOFTWARE

ADVENTURE INTERNATIONAL	
All Scott Adams' Adventures (each)	15.95

ATARI	
Music Composer	48.96
Kingdom	12.71
Hangman	12.71
Energy Czar	12.71
Blackjack	12.71
Space Invaders	16.96
Basketball	33.96
Video Easel	33.96
Super Breakout	33.96
Computer Chess	33.96
3D Tic Tac Toe	33.96
Star Raiders	48.96
Scram	16.96
Asteroids	33.96
Missile Command	33.96
Mailing List	16.95
Mortgage & Loan Analysis	12.71
Bond Analysis	21.21
Stock Analysis	21.21
Stock Charting	21.21
Calculator	25.46
Financial Management System	60.00
Dow Jones Invest. Eval.	79.95
Accounts Receivable System	399.00
General Accounting System	399.00
Inventory Control	399.00
Word Processor	129.95
All Talk & Teach Cassettes	25.95
Invitation To Prog. 1, 2, 3 (each)	16.96
Touch Typing	21.21
Conv. Span, Fren, German (each)	50.96
Statistics I	16.96
Educ. Sys. Master Cartridge	19.95
States & Capitals	12.71
European Countries & Caps.	12.71
Graph It	16.96
Assembler/Editor	48.96
Telelink I	21.21
Microsoft BASIC	74.95
Pilot	74.95

CRYSTALWARE	
Fantasyland	49.95
House Of Usher	19.95
Gallactic Quest	24.95
Sumer	16.95
World War II	25.95
Laser Wars	25.95
Sands Of Mars	35.95
Beneath The Pyramids	25.95
Little Crystal	35.95
Waterloo II	44.95

DYNACOMP	
Poker Party	15.95
Valdez	13.95
Flight Simulator	15.95
Monarch	10.95
Intruder Alert	14.95
Giant Slalom	12.95
Mail List 2.2	29.95
The Communicator	42.95
LJK- Letter Perfect Word Processor	129.95

PDI	
Minicrossword	14.95
Code Breaker	14.95
Memory Builder	14.95
Bowling	14.95
Vocabulary I & II (each)	14.95
Number Series	14.95
Reading Comprehension	14.95
Pre-School IQ Builder I & II (ea)	14.95
Addition With Carrying	14.95
Quantatative Comparisons	15.95

PERSONAL SOFTWARE	
Microchess	17.95
Checker King	17.95
VisiCalc	169.95

QUALITY SOFTWARE	
Fast Gammon	16.96
Tari Trek	10.16
Tank Trap	10.16
Disassembler	10.16
Assembler	21.21
3D Supergraphics	33.96
QS Forth	67.96

AND MUCH MORE!!

HARDWARE

ATARI 800 16K	747.00
ATARI 400 16K	338.00
ATARI 410 Recorder	65.00
ATARI 810 Disk Drive	429.00
ATARI 815 Dual Disk	1049.00
ATARI 820 Printer	360.00
ATARI 822 Printer	360.00
ATARI 825 Printer	599.00
ATARI 830 Modem	175.00
ATARI 850 Intf. Mod.	149.00
8K Ram	49.00
16K Ram	89.00
Paddles (pr)	17.00
Joystick (each)	9.00
Blank Diskettes (5)	22.50

CALL FOR CHRISTMAS SPECIALS !!!

FREE CATALOG AVAILABLE

SOFTWARE STREET
3392 Clipper Dr.
Chino, CA 91710
(714) 597-6959

ATARI IS A REGISTERED TRADEMARK

$2.00 minimum shipping
prices subject to change

CIRCLE 234 ON READER SERVICE CARD

Atari, continued...

You can find the beginning of the variable table by:
VT=PEEK(134)+256*PEEK(135)
and the array table by:
AT=PEEK(140)+256*PEEK(141)

Next, we must consider the actual layout of the variable table entries. I will assume that RAM$ and ROM$ are the first two variables in the table. In reality, to do this they must be the first variables typed in a NEW program or ENTERed from a program LISTed to disk (A SAVE-LOAD won't work, it stores the variable table along with the program). So if you are starting out with a new program, just have the DIM line (10 DIM RAM$(1),ROM$(1)) as the first line of your program after a NEW. If you're adding these to an existing program, make that the first line and LIST-ENTER it to disk.

Note: The variable table entry is created for any variable referenced by your program. This includes variables you used once and then deleted; they are still there taking up space. You can run out of space in the variable table when it gets too full of these nonexistent variables. LIST, then ENTER the program from disk to clear out the table; it forces a new variable table to be built.

Table 1 shows the variable table with explanations.

This is the entry for RAM$, the first string in the table. The entry for ROM$ immediately follows.

This subroutine should now become clear. It modifies the address and length of RAM$ to that of the chracter set. It not only copies ROM$ to RAM$, it also modifies the variable table data for ROM$. (All the modifying, by the way, is quite speedy, so the RAM$=ROM$ still executes much faster than the previous POKE copy). (See Program 9.)

Conclusion

Well, there you have it. A painless introduction to character sets. If you've a mind for a little experimenting, you can have a great deal of fun with them, while expanding the abilities of your Atari tremendously. I'm considering using multiple reprogrammed characters, for example, in a dungeon game I'm thinking of writing, to show in fine detail the monster approaching you. That's just one of many applications. ☐

Location	Value	Meaning
VT+0	129	"This is a string"
VT+1	0	"This is variable #0"
VT+2, VT+3	??	16 bits. Location from the start of AT.
VT+4, VT+5	??	DIMensioned length.
VT+6, VT+7	??	In-use length

Table 1.

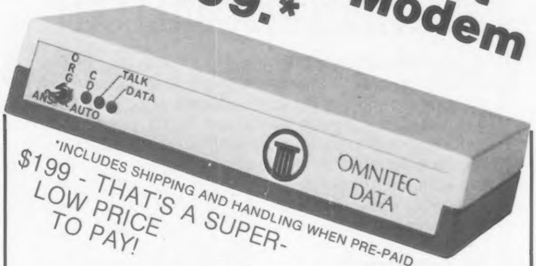
```
50 REM PROGRAM 8
60 REM COPIES CHARSET TO RAM
70 REM POKES POINTER B/4 COPY
80 REM ADDS SMILE
100 MEMTOP=PEEK( 106 )
110 GRTOP=MEMTOP-4
120 POKE 106,GRTOP
130 REM RESET
140 GRAPHICS 0
141 LIST
145 CHROM=PEEK( 756 )*256
150 REM NOW MODIFY POINTER
160 POKE 756,GRTOP
170 CHRAM=GRTOP*256
180 PRINT "COPYING."
500 FOR N=0 TO 1023
510 POKE CHRAM+N,PEEK( CHROM+N )
520 NEXT N
530 PRINT "COPIED."
540 REM ABCDEFGHIJKLMNOPQRSTUVWXYZ
550 REM 123567890!"#$%&'@( )< >-=+*
1000 REM SMILE BUTTON LAYOUT:
1010 REM 00000000 00 00
1020 REM 01100110 66 102
1030 REM 01100110 66 102
1040 REM 00000000 00 000
1050 REM 01000010 42 66
1060 REM 00111100 3C 60
1070 REM 00011000 18 24
1080 REM 00000000 00 00
1089 REM
1090 DATA 00,102,102,000,66,60,24,00
1100 FOR ADDR=CHRAM TO CHRAM+7
1110 READ DAT:POKE ADDR,DAT
1120 NEXT ADDR
```

Program 8.

```
4 REM PROGRAM 9
5 REM PROGRAM TO COPY ROM TO RAM
6 REM USING STRING MANIPULATORS
7 REM
8 REM NOTE MOST CALCULATIONS ARE NOT
9 REM HARDCODED TO ALLOW OTHER USE
10 DIM RAM$( 1 ),ROM$( 1 ):REM VT ENTRY 1
90 REM GET ARRAY,VARIABLE,DL,DM LOC
105 AT=PEEK( 140 )+256*PEEK( 141 )
110 VT=PEEK( 134 )+256*PEEK( 135 )
120 POKE 106,PEEK( 106 )-16:REM 4K MOVE
125 GRAPHICS 0:REM RESET OUT OF TOP AREA
130 RAMLOC=PEEK( 106 )*256
150 REM CALCULATE OFFSET FROM AT
160 OFFRAM=RAMLOC-AT
170 OFFROM=( 14*4096 )-AT
220 REM CALCULATE LO,HI BYTES
225 LENS=1025:REM C-SET LENGTH
230 LENHI=INT( LENS/256 )
240 LENLO=INT( LENS-( LENHI*256 ))
245 REM
250 OFFRAMH=INT( OFFRAM/256 )
260 OFFRAML=INT( OFFRAM-( 256*OFFRAMH ))
270 OFFROMH=INT( OFFROM/256 )
280 OFFROML=INT( OFFROM-( 256*OFFROMH ))
300 REM REWRITE RAM$ DATA IN VT
310 REM VT+0 = 129
320 REM VT+1 = 0   (VAR #0 )
330 POKE VT+2,OFFRAML:REM OFFSET
340 POKE VT+3,OFFRAMH:REM OFFSET
350 POKE VT+4,LENLO:REM DIM LENGTH
360 POKE VT+5,LENHI:REM DIM LENGTH
370 POKE VT+6,LENLO:REM USED LENGTH
380 POKE VT+7,LENHI:REM USED LENGTH
400 REM REWRITE ROM$ DATA IN VT
410 REM VT+8 = 129
420 REM VT+9 = 1   (VAR #0)
430 POKE VT+10,OFFROML:REM OFFSET
440 POKE VT+11,OFFROMH:REM OFFSET
450 POKE VT+12,LENLO:REM DIM LENGTH
460 POKE VT+13,LENHI:REM DIM LENGTH
470 POKE VT+14,LENLO:REM USED LENGTH
480 POKE VT+15,LENHI:REM USED LENGTH
500 REM RESTORE CHBAS POINTER
510 POKE 756,PEEK( 106 )
515 REM NOW DO COPY.
520 RAM$=ROM$
```

Program 9.

A Direct-Connect Auto-Answer Modem for $199.* Now!



*INCLUDES SHIPPING AND HANDLING WHEN PRE-PAID

$199 - THAT'S A SUPER-LOW PRICE TO PAY!

It's our **Model 9123** and we'll ship Factory-Direct Post-Paid for only $199 each. Check the features. It's one of the best buys ever for the personal computing field. **✓ 0-300 Baud ✓ Automatic Voice to Data Transfer ✓ FCC Registered for connection to any Switched Telephone Network ✓ Manual Originate/Answer/Auto Answer ✓ RS232C Capability with Bell 100 Series and 212A Compatibility.**

Take advantage of our 15 years experience in Data Communications — order your 9123 today!

CALL 800-528-8423 OR SEND CHECK/MONEY ORDER

[illegible]

OMNITEC DATA
New Dimensions in Modems
2405 South 20th Street • Phoenix, Arizona 85034

CIRCLE 191 ON READER SERVICE CARD

SPEED
POWER
EFFICIENCY

OSI
65D3 SYSTEMS

R-EDIT: Edit any program or text with ease! $40

- FULL CURSOR control. Insert, delete, add anywhere on the screen.
- BASIC,assembler, etc. edited without reloading RAM-resident editor.
- SYSGEN relocates R-EDIT and customizes.

SPUL65: Printer Spooler & Virtual Indirect File $95/$10

- DON'T WAIT for your printer. Process words. Write programs. Put multiple print jobs in the queue. Keep working while the printer runs!
- TWO printers accomodated on any ports. Multiple copies with pagination.
- SYSGEN relocates SPUL65 and allows extensive customization.
- VIRTUAL INDIRECT FILES on disk. End space problems when using temporary files. Now do extensive editing of BASIC with your word processor.

XREF: BASIC Cross Referencer $25

- TABULATES: Referenced line numbers, all variable names, and functions.
- FAST machine language program.
- DISK based to handle the largest BASIC source files on any drive.

FBASIC: BASIC Compiler $155/$10

- FAST machine code now can be written with the ease of BASIC.
- SPEED-optimized, native-code compiler. An integer subset of OSI's BASIC.
- DISK based to allow large source and object files.
- EXTENSIONS to BASIC for: Easy interface to system hardware/software. Direct access to 6502 registers. Array initialization and optional absolute location. WHILE and other structures. Interfacing compiler output and interpreter.
- UTILITIES (plus source), manual, and many useful examples.

CP/M to OSI Translation

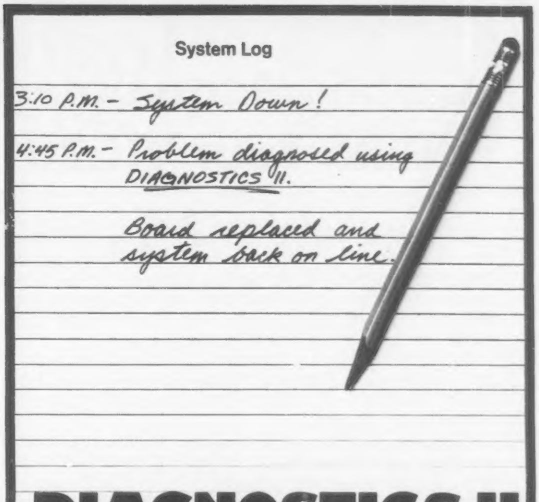
Frustrated by all those good CP/M disks that won't run on your OSI CP/M system? Send us your disk, $15, and we'll send it back with an OSI compatible version.

drc software

Data Resource Corporation, Suite 202
1040 Lunaai St., Kailua, HI 96734 (808) 261-2012

Manual orders applied to software purchases. Programs supplied on 8-in, single-density, single-sided disks. Hawaii residents add 4% tax.

CIRCLE 256 ON READER SERVICE CARD



System Log

3:10 P.M. - System Down!

4:45 P.M. - Problem diagnosed using DIAGNOSTICS II.

Board replaced and system back on line.

DIAGNOSTICS II

Diagnostics II is SuperSoft's expanded Diagnostic package.

Diagnostic II builds upon the highly acclaimed Diagnostics I. It will test each of the five areas of your system:

Terminal Memory Printer CPU Disk

Every test is expanded.

Every test is "submit"-able. A "submit" file is included in the package which "chains" together the programs in Diagnostics II, achieving an effective acceptance test. All output can be directed to a log file for unattended operation, for example over night testing. Terminal test is now generalized for most crt terminals. A quick-test has been added for quick verification of the working of the system.

The memory test is the best one we have encountered. It has new features, including:

- default to the size of the CP/M Transient Program Area
- printout of a graphic memory map
- bank selection option
- burn in test
- memory speed test

Diagnostics-II includes the only CPU test for 8080/8085/Z80.

A Spinwriter/Diablo/Qume test has been added, which tests for the positioning and control features of the Spinwriter/Diablo/Qume as well as its ASCII printing features. (Serial Interface only)

And, as with all SuperSoft products, a complete online HELP system and user manual is included.

Price: $100.00 (manual only): $15.00
Requires: 32K CP/M

Software available for virtually all CP/M systems. Specify your system.

Available from fine dealers everywhere, or directly from:
SUPERSOFT ASSOCIATES
P.O. BOX 1628
CHAMPAIGN, IL 61820
(217)-359-2112
Technical Hot Line: (217)-359-2691

*CP/M REGISTERED TRADEMARK DIGITAL RESEARCH

U.K. and Europe:
DIGITAL DEVICES
134 LONDON ROAD
SOUTHBOROUGH KENT
TUNBRIDGE WELLS
TN4 OPL
ENGLAND Telex: 95582
Tel: Tunbridge Wells (0892) 37977/9

Japan:
ASR CORPORATION INTERNATIONAL
1-2-8, SHIBA-DAIMON
TOKYO 105
JAPAN
Tel: (03)-437-3901 Telex: 242-3296

SuperSoft
First in Software Technology

CIRCLE 175 ON READER SERVICE CARD

Getting Acquainted With Your VIC20

Getting Acquainted With Your VIC20 by Tim Hartnell leads the reader, step by simple step, from the absolute basics of programming the VIC to writing complex, sophisticated programs. It thoroughly describes use of the sound, music and color graphics capabilities and illustrates the use of these functions in over 60 programs and games.

By following the comprehensive explanation given for each program and computer function, the reader will learn a great deal about the VIC, the Basic language and microcomputers in general.

Parents and teachers will find the section "VIC as a Teacher" a valuable aid in making the most effective use of the computer in the teaching/learning process.

This book is a worthwhile resource and will help the reader make the most of his computer. The reader will never feel quite the same about it after surviving a round of FRENZY, or listening to the VIC20 compose a 'symphony'.

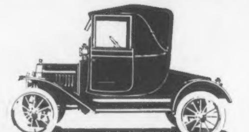
Softbound, 132 pages, 5 1/2" x 8", $8.95; add $1.50 for shipping and handling.

creative computing

39 E. Hanover Avenue
Morris Plains, NJ 07950

Toll-free **800-631-8112**
In NJ 201-540-0445

CIRCLE 300 ON READER SERVICE CARD



210,000 MILES PER GALLON!

Take a colorful, challenging 700 mile journey in this computer version of the French card game loved by millions around the world. Overcome accidents, flat tires, gas shortages, speed limits, and traffic lights to arrive before your opponent. Spectacular high resolution color graphics will make this the program you use to demonstrate the abilities of your Apple II. Beat the energy shortage; with your computer and a color TV, you can play over 300 games on the electricity made from one gallon of oil.

MILESTONES
48K Apple II Plus Applesoft Basic
Cassette CS 4015 $14.95 Diskette CS 4515 $19.95

Order Today

To order any of these software packages, send payment plus $2.00 postage and handling per order to Creative Computing, Morris Plains, NJ 07950. Visa, MasterCard and American Express orders may be called in toll-free.

Order today at no risk. If you are not completely satisfied, your money will be promptly and courteously refunded.

creative computing software

39 E. Hanover Avenue
Morris Plains, NJ 07950
Toll-free **800-631-8112**
In NJ 201-540-0445

CIRCLE 300 ON READER SERVICE CARD

The Investor's Edge

If you are a serious investor, you need to be able to know how well you are doing, how well your past strategies have worked, the potential success of future actions, and even the present state of your portfolio to make intelligent decisions. A computer with the right program can significantly reduce the amount of effort necessary to determine this information.

Stock and Options Analysis, by Dr. Alfred Adler, contains four programs that can justify the purchase of a computer by the serious investor. With these programs, you can easily graph the possible returns from different investment strategies. You can intelligently use puts and calls in combination with stock purchases and sales to minimize risk, maximize returns, or even limit risk at the same time you increase returns. Another program allows you to quickly produce a listing, item by item, of the cost, current value per share, total current value and capital gain of a portfolio that may mix long and short stock and long and short option positions.

Stock and Options Analysis is available for two popular microcomputer systems, the Apple II and the TRS-80. It comes with a 25 page instruction manual that thoroughly discusses the use of computer generated charts and tables generated by these programs to analyze your own investment strategy. The manual is available separately for $2 and we recommend that you purchase it first if you have any hesitation about purchasing this outstanding package.

STOCK AND OPTIONS ANALYSIS
CS 3801 TRS-80 Diskette (32K of memory) $99.95
CS 4801 Apple II Diskette (32K of memory) $99.95
RP-03 Instruction booklet (separately) $2.00

Also available for the TRS-80 computer:
Advanced Statistics
CS 3303 16K Cassette $24.95
CS 3505 32K Diskette $24.95

Graphics Package
CS 3301 16K Cassette $11.95

Investment Analysis (6 programs)
CS 3305 4K Cassette $24.95

Order Today

To order any of these software packages, send payment plus $2.00 postage and handling per order to Creative Computing, Morris Plains, NJ 07950. Visa, MasterCard and American Express orders may be called in toll-free.

Order today at no risk. If you are not completely satisfied, your money will be promptly and courteously refunded.

creative computing software

39 E. Hanover Avenue
Morris Plains, NJ 07950
Toll-free **800-631-8112**
In NJ 201-540-0445

CIRCLE 300 ON READER SERVICE CARD

TRS-80

Apple II

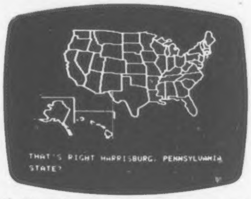
sensational software

creative computing software

CAI Programs Vol I

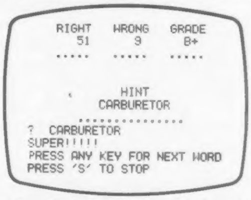
Cassette CS-4201 $11.95

Requires 16K Apple II or Apple II Plus



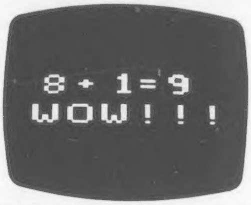
```
THAT'S RIGHT HARRISBURG, PENNSYLVANIA
STATE?
```

U.S. Map. Identify states and their capitals.



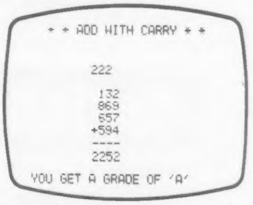
```
        RIGHT   WRONG   GRADE
         51       9      B+
        .....   .....   .....


               HINT
            CARBURETOR
          ...............
? CARBURETOR
SUPER!!!!!
PRESS ANY KEY FOR NEXT WORD
PRESS 'S' TO STOP
```

Spelling. Study aid with your list of troublesome words.



```
8 + 1 = 9
WOW!!!
```

Math Drill. Arithmetic drill and practice with large or small display.



```
    * * ADD WITH CARRY * *

            222

            132
            869
            657
           +594
           ----
           2252

  YOU GET A GRADE OF 'A'
```

Add With Carry. Drill and practice on sums requiring numbers to be carried.

Ecology Simulations - I

Disk CS-4706 $24.95

Cassette CS-3201 $24.95
Disk CS-3501 $24.95

Requires 48K Applesoft in ROM or Apple II Plus
Requires 16K TRS-80
Requires 32K TRS-80

Sterl

STERL allows you to investigate the effectiveness of two different methods of pest control—the use of pesticides and the release of sterile males into a screw-worm fly population. The concept of a more environmentally sound approach versus traditional chemical methods is introduced. In addition, STERL demonstrates the effectiveness of an integrated approach over either alternative by itself.

Pop

The POP series of models examines three different methods of population projection, including exponential, S-shaped or logistical, and logistical with low density effects. At the same time the programs introduce the concept of successive refinement of a model, since each POP model adds more details than the previous one.

Tag

TAG simulates the tagging and recovery method that is used by scientists to estimate animal populations. You attempt to estimate the bass population in a warm-water, bass-bluegill farm pond. Tagged fish are released in the pond and samples are recovered at timed intervals. By presenting a detailed simulation of real sampling by "tagging and recovery," TAG helps you to understand this process.

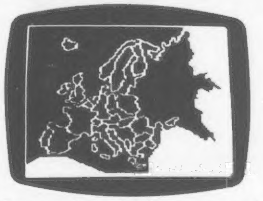
Buffalo

BUFFALO simulates the yearly cycle of buffalo population growth and decline, and allows you to investigate the effects of different heard management policies. Simulations such as BUFFALO allow you to explore "what if" questions and experiment with approaches that might be disatrous in real life.

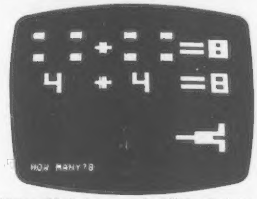
CAI Programs Vol II

Cassette CS-4202 $11.95

Requires 16K Apple II or Apple II Plus



European Map. Identify countries and their capitals.



```
- - + - - = 8
- - + - - = 8
4 + 4 = 8

HOW MANY?8
```

Meteor Math. Learn math skills by destroying menacing meteors.

Music Composing Aid. Make and play your own music on the Apple. No additional hardware required. Includes a sample from Bach's Tocatta & Fugue in D minor.

Ecology Simulations - II

Disk CS-4707 $24.95
Cassette CS-3202 $24.95
Disk CS-3502 $24.95

Requires 48K Applesoft in ROM or Apple II Plus
Requires 16K TRS—80
Requires 32K TRS-80

Pollute

POLLUTE focuses on one part of the water pollution problem; the accumulation of certain waste materials in waterways and their effect on dissolved oxygen levels in the water. You can use the computer to investigate the effects of different variables such as the body of water, temperature, and the rate of dumping waste material. Various types of primary and secondary waste treatment, as well as the impact of scientific and economic decisions can be examined.

Rats

In RATS, you play the role of a Health Department official devising an effective, pratical plan to control rats. The plan may combine the use of sanitation and slow kill and quick kill poisons to eliminate a rat population. It is also possible to change the initial population size, growth rate, and whether the simulation will take place in an apartment building or an eintire city.

Malaria

With MALARIA, you are a Health Official trying to control a malaria epidemic while taking into account financial considerations in setting up a program. The budgeted use of field hospitals, drugs for the ill, three types of pesticides, and preventative medication, must be properly combined for an effective control program.

Diet

DIET is designed to explore the effect of four basic substances, protein, lipids, calories and carbohydrates, on your diet. You enter a list of the types and amounts of food eaten in a typical day, as well as your age, weight, sex, health and a physical activity factor. DIET is particularly valuable in indicating how a diet can be changed to raise or lower body weights and provide proper nutrition.

CAI Programs I and II

Disk CS-4701, $24.95
Requires 32K Integer Basic

This disk contains all 7 programs from cassettes CS-4201 and CS-4202.

Note: The ecology simulations programs are not available on cassette.

Stock & Options Analysis

Stock & Options
Disk CS-4801 $99.95
Requires 32K Applesoft or Apple II Plus
Disk CS-3801 $99.95
Requires 32K TRS-80

This is a comprehensive set of four programs for the investment strategy of hedging listed options against common stocks. A complete description is in the TRS-80 section.

Order Today

To order any of these software packages, send payment plus $2.00 postage and handling per order to Creative Computing, Morris Plains, NJ 07950. Visa, MasterCard and American Express orders may be called in toll-free.

Order today at no risk. If you are not completely satisfied, your money will be promptly and courteously refunded.

Creative Computing Software
Morris Plains, NJ 07950
Toll-free **800-631-8112**
In NJ, 201-540-0445

creative computing software

Apple is the registered trademark of Apple Computer, Inc.

CIRCLE 350 ON READER SERVICE CARD

Making the Most of Your TRS-80 Color Computer

Making The Most of Your TRS-80 Color Computer by Tim Hartnell is a curious and interesting book. While at first sight it appears to be a book which simply tells the reader how to write and develop games programs for the Radio Shack TRS-80 Color Computer—and gives the listings of over 60 programs in the process—it is far more. By simply studying the explanation given for each game and computer function the reader will learn a great deal about the Color Computer, the BASIC language and micro-computers in general.

However, the book is not all games. For parents or teachers the section "The Color Computer As a Teacher" is a valuable aid in making the most effective use of the computer in the teaching/learning process.

The book is a worthwhile resource and will help the reader make the most of his computer. The reader will never feel quite the same about it after surviving a round of FRENZY, or listening to the Color Computer compose a 'symphony'.

Softbound, 144 pages, 5 1/2" x 8", $8.95; add $1.50 for shipping.

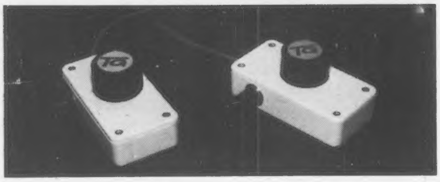
creative computing

39 E. Hanover Avenue
Morris Plains, NJ 07950

Toll-free **800-631-8112**
In NJ 201-540-0445

CIRCLE 350 ON READER SERVICE CARD

Super Paddle



Are the paddle controllers on your Apple wearing out? Or did you get a new Apple without paddles?

We've got good news for you! Super Paddles. Each paddle control consists of a high-precision linear potentiometer and a big (1/2" D) industrial-quality pushbutton mounted in a sturdy 4" x 2" x 1" metal case which matches the Apple. Each of the two paddles is connected with a long 5-foot cable to the Apple paddle socket.

Every component in a set of Super Paddles is the very finest quality available. The set is backed by a 90-day limited warranty from the manufacturer as well as Peripherals Plus' moneyback guarantee of satisfaction.

To order, send $39.95 plus $2.00 postage and handling (NJ residents add $2.00 sales tax) to the address below. Credit card customers may call orders to our toll-free number.

Peripherals Plus

Toll-free **800-631-8112**
(in NJ 201-540-0445)

39 E. Hanover Avenue
Morris Plains, NJ 07950

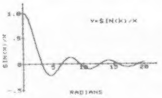
CIRCLE 239 ON READER SERVICE CARD

GRAPHICS FOR LABS

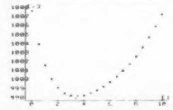
BY PAUL K. WARME

SCIENTIFIC PLOTTER

48K APPLE II +, $24.95



Draws professional-looking graphs of your data. EASIER, FASTER, NEATER and more ACCURATE than hand-plotting. You choose data format, length and position of axes, 20 symbols, error bars, labels anywhere in 4 orientations etc. Includes 5 DEMOS on disk with 30-PAGE MANUAL.



CURVE FITTER

48K APPLE II +, $34.95

Selects the best curve to fit your data. SCALE, TRANSFORM, AVERAGE, SMOOTH, INTERPOLATE (3 types), LEAST SQUARES FIT (3 types), EVALUATE UNKNOWNS from fitted curve. Includes 5 DEMOS on disk with 33-PAGE MANUAL.

Order Today

To order any of these software packages send payment plus $2 00 postage and handling per order to Creative Computing Morris Plains NJ 07950 Visa MasterCard and American Express orders may be called in toll-free

Order today at no risk If you are not completely satisfied your money will be promptly and courteously refunded

creative computing software

Morris Plains NJ 07950
Toll-free **800-631-8112**
In NJ 201-540-0445

CIRCLE 300 ON READER SERVICE CARD

Can a Small Computer Really Save You Time?

Yes. If you know the right way to use it. And that's where we can help.

Whatever your business—manufacturing or banking, retail or research—*Small Business Computers* is *the* magazine that will dramatically increase your business effectiveness while saving you both time and money. In a down-to-earth style, *Small Business Computers* explains how to use small computers effectively in your business.

Our hard-hitting *evaluations* help you select the best equipment and software packages to meet your specific needs. Our easy-to-read *tutorial articles* describe how businesses make effective use of micros and minis. And our program *applications* are guaranteed to save you time and money.

To enter your subscription at no risk whatsoever, send us your business card. If you are not completely satisfied after seeing SBC, write "cancel" across your invoice. One year (6 issues) costs just $12.

Subscribe today at no risk. *Small Business Computers* is the best consultant your business will ever have.

Small Business Computers Magazine

39 E. Hanover Ave. Morris Plains, NJ 07950
Toll-free **800-631-8112**
(In NJ 201-540-0445)

CIRCLE 290 ON READER SERVICE CARD

Super Cassette Sale

Cassettes. A thing of the past? You might think so by the number of software houses that have dropped them from their line in the past year or so.

However, we have always tried to make our software available on both cassette and disk for as many computers as possible. This is a policy we intend to continue.

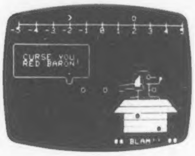
But right now we have so many new software packages coming along that we are consolidating and merging some of the programs from our cassettes into the new lineup. As a result we are selling out of some existing cassettes now in stock.

All of the cassettes are high quality, durable tape in Norelco-style plastic boxes and are backed by our unconditional guarantee. The savings on these cassettes are tremendous! 20 to 45%. So order yours now! At these prices they'll move fast.

All orders subject to stock on hand.

PET/CBM

Graphic Games-1 cassette includes Escape, Snoopy, Chase, Sweep, and Darts. Top rated by three reviewers! Available in old and new ROM version. CS-1004 regular $11.95, sale price $7.95.



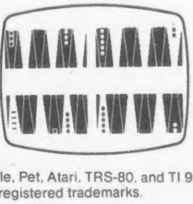
Graphic Games-2 cassette includes Checkers, Dodgem, Bounce, Nuclear Reaction, LEM, and Artillery. Our most popular Pet cassette. Available in old and new ROM version. CS-1005 regular $11.95, sale price $7.95.

Conversational Games cassette includes Hexletter, Hurkle, Hangman, Haiku, and Eliza. Old and new ROM version available. CS-1006 regular $11.95, sale price $7.95.

Board Games cassette includes Yahtzee, One-Check, Backgammon, Trek 3, and Blackjack. Old and new ROM available. CS-1007 regular $11.95, sale price $7.95.

SUPER PET SALE

Take all four cassettes (21 programs in all!) for only $29.95.



Apple, Pet, Atari, TRS-80, and TI 99/4 are registered trademarks.

ADVENTURES

Adventureland will excite you as you search for treasures on a deserted island, or so you think! Available for the 16K Apple II or Apple II Plus (CS-4011), or the Sorceror (CS-5003), list $14.95, sale price $11.95.

Pirate Adventure takes you from your London flat to try to recover Long John Silver's buried treasure. Available for the 16K Apple II or the Apple II Plus (CS-4012), TRS-80 (CS-3008) or the Sorcerer (CS-5004). List $14.95, sale price $11.95.

Your **Mission Impossible**, if you decide to accept it, is to save the world's first nuclear reactor from doom. Available for the 16K Apple II or the Apple II Plus (CS-4013), or the Sorcerer (CS-5005). List $14.95, sale price $11.95.

Wander through the **Voodoo Castle** in search of the secret of Count Cristo, but beware the Voodoo man. Available for the 16K Apple II or the Apple II Plus (CS-4014), TRS-80 (CS-3010) or the Sorcerer (CS-5006). List $14.95, sale price $11.95.

Beware **The Count** as you move through the haunted castle looking for clues to allow you to escape unharmed. Available for the 16K TRS-80 (CS-3011), or the Sorcerer (CS-5007). List $14.95, sale price $11.95.

Other suppliers are raising the price on these programs to $19.95. Save 50% with this never-to-be-repeated offer while supplies last!

Apple II
CS-4011 Adventureland
CS-4012 Pirate Adventure
CS-4013 Mission Impossible
CS-4014 Voodoo Castle
Package price $39.95

Sorcerer
CS-5003 Adventureland
CS-5004 Pirate Adventure
CS-5005 Mission Impossible
CS-5006 Voodoo Castle
CS-5007 The Count
Package price $49.95

TRS-80
CS-3008 Pirate Adventure
CS-3010 Voodoo Castle
CS-3011 The Count

Package Price $28.95

TRS-80

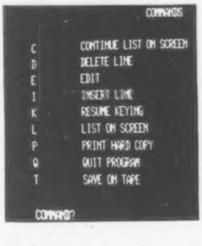
Space Games includes Star Lanes, Romulan, Star Wars and Ultra Trek. Cassette (CS-3002) list $11.95, sale price $9.49.

Strategy Games includes Evasion, Tunnel Vision, Motor Racing, Jigsaw, and The Masters. One of our most popular cassettes! Cassette (CS-3005) list $11.95, sale price $9.49.

Battle Games includes Gunner, Sub Hunt, Tank Battle, and Getacross. Rave reviews of this package Cassette (CS-3012) list $11.95, sale price $9.49.

Deep Space Games includes three challenging games: Space Lifeboat, Asteriods, and Galaxy I. Cassette (CS-3013) list $11.95, sale price $9.49.

Text Processing is a line-oriented simplified text editor for letters, documents, reports, etc. Cassette (CS-3302) list $14.95, sale price $11.95.



```
                    COMMANDS

C      CONTINUE LIST ON SCREEN
D      DELETE LINE
E      EDIT
I      INSERT LINE
K      RESUME KEYING
L      LIST ON SCREEN
P      PRINT HARD COPY
Q      QUIT PROGRAM
T      SAVE ON TAPE

COMMAND?
```

Checking Account is a home budgeting system that keeps track of individual checks, payees, etc. Cassette (CS-3304) list $11.95, sale price $9.49.

IQ Test is a valid 60 question IQ test with a machine language scoring routine that defies cheating. Cassette (CS-3203) list $14.95, sale price $11.95.

TRS-80 SALE

Pick any four packages for $29.95. Take all seven for $49.00.

SOL-20

Air Traffic Controller simulates, in real time, the actions and responsibilities of an air traffic controller. Cassette (CS-8001) list $11.95, sale price $9.50.

Space Games includes Asteriods, Lunar, Star Wars, and Romulan. Cassette (CS-8003) list $11.95, sale price $9.50.

Strategy Games includes Wumpus I, Wumpus II, Trap, Race and Kingdom. Our most popular Sol package. Cassette (CS-8004) list $11.95, sale price $9.50.

Reading Comprehension will help students to learn the skills needed to master good reading habits. Available in a five-cassette package for $50.00, sale price $39.95.

GAME SALE

CS-8001 Air Traffic Controller
CS-8003 Space Games
CS-8004 Strategy Games
Package price $24.95.

APPLE Games Sale

Space Games-1 includes four games by Bob Bishop: Saucer Invasion, Rocket Pilot, Star Wars, and Dynamic Bouncer. Available in Integer and Applesoft version (CS-4001) list $11.95, sale price $9.49.

Sports Games-1 includes Baseball, Breakout, Torpedo Alley and Darts. Available in Integer version ONLY (CS-4002) list $11.95, sale price $9.49.

Strategy Games includes Blockade, UFO, Skunk, Genius and Checkers. Available in Integer version ONLY (CS-4003) list $11.95, sale price $9.49.

Brain Games includes Dodgem, Nuclear Reaction, Parrot, Dueling Digits, Midpoints, Lines, and Tones. Available in Integer version ONLY (CS-4004) list $11.95, sale price $9.49.

Haunted House is a nightmare simulation leaving you only six hours to find the secret passage leading out of the many room mansion. Available in integer version ONLY (CS-4005) list $11.95, sale price $9.49.

Space Wars is a version of a classic MIT game redesigned for the Apple. Available in Integer and Applesoft version (CS-4009) list $14.95, sale price $11.95.

Outdoor Games includes Forest Fire, Fishing Trip, Treasure Island I and Treasure Island II. Available in Integer version ONLY (CS-4010) list $14.95, sale price $11.95.

Know Yourself includes Alcohol, Sex Role, Life Expectancy, Psychotherapy, and Computer Literacy. Available in Integer version ONLY (CS-4301) list $11.95, sale price $9.49.

INTEGER SALE

Pick any four tapes for $32.95. Pick any six tapes for $44.95. Take all eight cassettes for $54.95.

Order Today

To order any of these software packages send payment plus $2.00 postage and handling per order to Creative Computing, Morris Plains, NJ 07950. Visa, MasterCard and American Express orders may be called in toll-free.

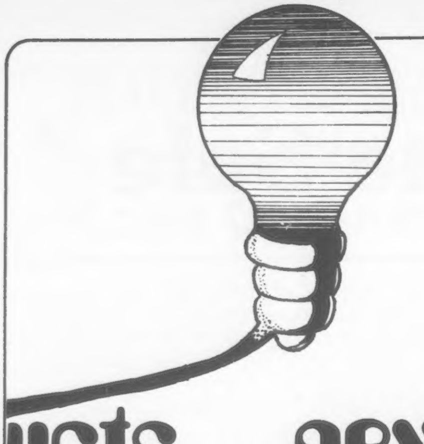
Order today at no risk. If you are not completely satisfied, your money will be promptly and courteously refunded.

master charge · AMERICAN EXPRESS · BANKAMERICARD VISA

creative computing software

39 E. Hanover Avenue
Morris Plains, NJ 07950
Toll-free **800-631-8112**
In NJ 201-540-0445

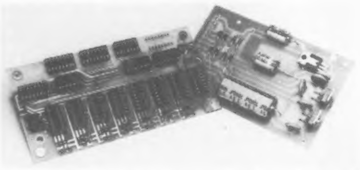
CIRCLE 300 ON READER SERVICE CARD



ucts...new products...new

CPU's, MEMORY

MEMORY FOR INTERACT



Micro Video Corporation has released a device which expands the RAM of the Interact computer to 32K.

Comprised of two PC boards—a memory board carrying the extra 16K RAM and a power supply board to absorb the load of the additional hardware—the expansion resides within the main electronics assembly housing of the computer.

The expansion gives users direct access to over 16K RAM for Basic programming, plus 4K for machine language routines accessible from Basic.

An expanded version of Microsoft Basic which provides access to the added memory, RS-232 support, and enhanced graphics capabilities is included in the expansion package. $226.50.

Micro Video, P.O. Box 7357, 204 E. Washington St., Ann Arbor, MI 48107. (313) 996-0626.

CIRCLE 351 ON READER SERVICE CARD

Z-80 CPU CARD FOR H-8

Heath Company announces the HA-8-6 Z-80 PCU Card for the Heath H-8 Computer.

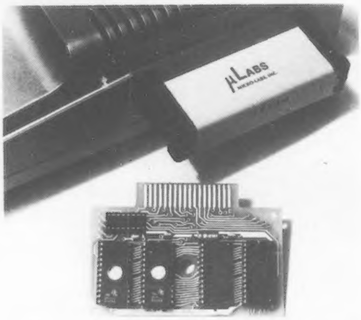
The Z-80 CPU Card is designed to replace the 8080A CPU supplied with the H-8, and is compatible with all current Heath disk-based software for the H-8.

The card also includes all features of the HA-8-8 Extended Configuration Option, eliminating the need to purchase the extended configuration option separately before adding the Heath CP/M Operating System or the Heath H-47 8" Floppy Disk System. $199.

Heath Company, Dept. 350-135, Benton Harbor, MI 49022. (In Canada, write Heath Company, 1480 Dundas St. E., Mississauga, ONT L4X 2R7.)

CIRCLE 352 ON READER SERVICE CARD

RAM/EPROM CARTRIDGE FOR TRS-80 COLOR



The CMemory plug-in cartridge for the TRS-80 Color Computer gives the user 8K of continuous memory. This memory can be divided up into any combination of 2K blocks of RAM memory and/or 2716 EPROMs.

Users may save programs on cartridges. The CMemory with RAM installed can also be used for storing copies of the video screen or machine language subroutines used by a Basic program.

The CMemory occupies the unused address space $C000 to $E000 normally reserved for plug-in game cartridges. By adding a jumper, the Color Computer can be set to automatically execute a program in EPROM whenever the reset button is pressed. $24.95. 2K RAM chips are available for $19.95 each, and 2K 2716 EPROMs for $14.

Micro-Labs, Inc., 902 Pinecrest, Richardson, TX 75080.

CIRCLE 353 ON READER SERVICE CARD

64K RAM CARD FOR APPLE II

Legend Industries, Ltd. announces a 64K RAM card for the Apple II computer.

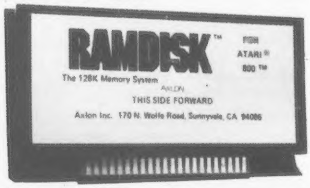
The board gives the Apple the ability to access double its own RAM space by bank switching 16K banks of RAM over the existing ROM space.

The board is compatible with the Apple Language Card and is configured to operate as four banks of Language Cards. $349.

Legend Industries, Ltd., P.O. Box 112, Pontiac, MI 48056.

CIRCLE 354 ON READER SERVICE CARD

MEMORY SYSTEM FOR ATARI 800



Axlon Incorporated has announced a 128K memory system for the Atari 800.

The Ramdisk Memory System comes with software that makes the new system function like a disk device. The system can also be programmed as bank selectable RAM memory.

The Ramdisk Memory System, when utilized as an additional disk device in conjunction with an Atari 810 disk drive, is compatible with existing software written for the Atari 800 system. $699.

Axlon Inc., 170 N. Wolfe Rd., Sunnyvale, CA 94086. (408) 730-0216.

CIRCLE 355 ON READER SERVICE CARD

JAY ROSENBERG'S

SUPER SKETCH

THE ULTIMATE
GRAPHICS PROGRAM

- KEYBOARD OR PADDLE CONTROL
- DRAW ALPHA-NUMERICS OF ANY SIZE, COLOR OR ANGLE
- MERGE ANY HI-RES PICTURES TOGETHER
- CREATE AND SAVE SLIDE SHOWS
- MOVE ENTIRE HI-RES PICTURES ANYWHERE ON THE SCREEN
- APPLE II+ 48K DISK

TO ORDER: SEND $24.95 TO

JAY ROSENBERG'S SUPER SKETCH
5 FRASER AVE.
MONTICELLO, N.Y. 12701

N.Y.S. RESIDENTS ADD 7% SALES TAX

CIRCLE 184 ON READER SERVICE CARD

MONEY BACK GUARANTEE

YORK 10 BASF-DPS

WORLD STANDARD TAPE

YORK 10
YORK 10 Computerware

- PROFESSIONAL 5-SCREW SHELL
- UNIVERSAL INDUSTRY ACCEPTANCE

DATA TRAC — C-10, C-20
MUSI TRAC — C-45, C-90

HERE'S WHAT USERS SAY ABOUT YORK 10 CASSETTES:

"Excellent tape – I haven't had a bad 'CSAVE' and volume level for 'CLOAD's is consistent for all cassettes. Your tape is good enough for me to order more; enclosed is a money order for two dozen more cassettes."
Robert W. Bruggemeyer
Long Beach, CA

"The quality to price ratio is very high on these cassettes – had very good luck loading programs back to the computer."
Douglas Elkins
Millinocket, ME

"High quality tape in the proper lengths and at the right price. Keep it up."
William E. Brown, Jr.
Reisterstown, MD

VISA

"YOU'VE TRIED THE REST, NOW BUY THE BEST"

master charge

Call: 213/710-1430 for IMMEDIATE SHIPMENT on Credit Card Orders.

ORDER NOW...Mail to: **YORK 10 Computerware**
24573 Kittridge St., #C3, Canoga Park, CA 91307

Please send cassettes checked below:

LENGTH	1 DOZEN	2 DOZEN	TOTAL
C-10	☐ 8.00	☐ 14.40	
C-20	☐ 10.00	☐ 18.00	
C-45	☐ 13.00	☐ 23.00	
C-90	☐ 21.75	☐ 39.00	
		SUB TOTAL	
		Calif. residents, add 6% sales tax	
		Shipping: 1 doz. $2, 2 doz. $3.50 addt'l. doz., $1.	
		TOTAL	

WRITE FOR QUANTITY DISCOUNTS
Shipped bulk-pack by UPS to street address in Cont. U.S.A. only. We cannot ship to P.O. Boxes.

☐ Check or M.O.enclosed ☐ Charge to my Credit Card:
☐ VISA ☐ MASTER CARD Expires date: ______

account no. ______

name ______

address ______

city ______ state/zip ______

signature ______

CIRCLE 283 ON READER SERVICE CARD

---

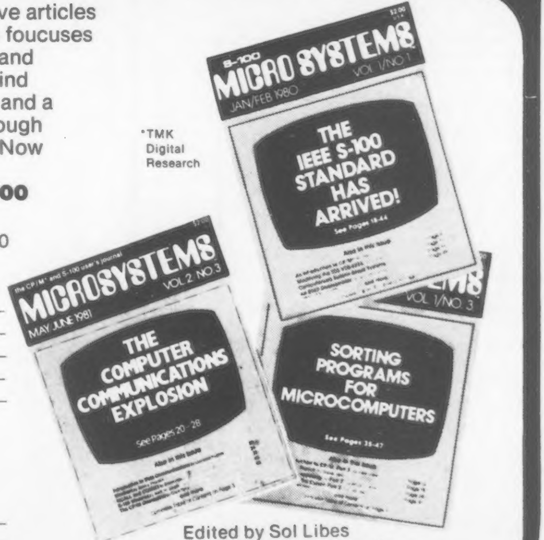
the CP/M* and S-100 user's journal

MICROSYSTEMS™

Finally, there's a magazine with up-to-date, informative articles for the serious microcomputer user! MICROSYSTEMS foucuses on CP/M*, Pascal, and related software, on North Star and S-100 bus hardware (including 16-bit systems). You,ll find applications, tutorials, hardware and software reviews, and a software directory. No longer will you have to hunt through magazines to find the articles you,ve been waiting for. Now you can find them all in MICROSYSTEMS!

Keep up with the latest developments in the S100 and CP/M world with MICROSYSTEMS!

*TMK
Digital
Research


S-100 MICRO SYSTEMS
JAN/FEB 1980
VOL 1/NO 1
THE IEEE S-100 STANDARD HAS ARRIVED!
MICROSYSTEMS
MAY/JUNE 1981
VOL 2 NO 3
THE COMPUTER COMMUNICATIONS EXPLOSION
VOL 1/NO. 3
SORTING PROGRAMS FOR MICROCOMPUTERS

MICROSYSTEMS, 39 E. Hanover Ave., Morris Plains, NJ 07950
☐ Sign me up!
☐ Send a sample copy ($2 enclosed)

Name ______
Address ______
City ______
State/Zip ______

Term	USA	Canada, Mexico	Foreign (Air)
3YR(18 issues)	☐ $24	☐ $38	☐ $69
2YR(12 issues)	☐ $18	☐ $27	☐ $48
1YR(6 issues)	☐ $10	☐ $15	☐ $25

☐ Payment enclosed ☐ Bill me ($1 charge)
☐ Visa ☐ Master Card ☐ American Express Exp. Date: ______
Card Number: ______
Signature: ______

Edited by Sol Libes
Published every other month

CIRCLE 247 ON READER SERVICE CARD

Computer Information Exchange
Box 159 (714) 757-4849
San Luis Rey CA 92068

Shack-80 Model-1 Users:

Restore Reliability

Tired of spontaneous re-booting, "loss" of memory, UL ERROR on programs that are correct, "BAD RAM" or ROM that is good and other symptoms of dirty edge connectors?

CIE Cramolin cleaning kit lets you quickly, safely strip away coatings of high-resistance oxide films built upon ..S-80's non-gold-plated edge fingers, and coat them to reduce further buildup. Contains one bottle cleaner, one lubricant/sealer.

CIE Cramolin $8.95 ($9.49 CA)

Silver Solder Rejuvinates Shack-80 Edge Connectors

Ratty Radio Shack edge fingers require frequent Cramolin cleaning for system reliability. Tandy did not gold plate them, but after you silver them you can tug cables and jar computer without system reboot!

Kit contains special high-quality flux and 16" (about 1.5 oz) of solder, 5-6% silver, balance tin (contains no cadmium, zinc, or lead). Caution: do not resolder fingers with ordinary solder, or system will be totally unusable!

CIE $4.50 ($4.77 CA)

Media Buys:

Diskettes

5" Unbranded, single-density, 10, in envelopes, fully guaranteed	$19.95*
5" Memorex sngl dens., box 10	$24.75*
5" Memorex dbl. dens., box 10	$26.55*
5" Dysan, plastic box of 10, double-density ultra-reliable	$44.95*
5" Wabash SSSD with hub ring	$26.55*
5" Wabash DSDD with hub ring	$$38.98*
Reinforcements, 50 rings for 5"	$7.75*
Ring tools--apply reinforcements	$4.95*
Cleaning kits, 3M or FD, 2 disks	$22.46*

GUARANTEE:
All CIE disks guaranteed
If you get a bad disk, CIE will replace it

Hardware:

Percom, LNDoubler Savings

DOUBLE DENSITY attachments $153.50/$157.50/$207*

Double disk storage with either Percom or LNW Research plug-in adapters. No soldering. Percom Doubler 2 comes with DoubleDOS TRSDOS varient, is $153.50*. LNDoubler 1 includes DOS-plus deluxe operating system. LNDoubler 5/8, with operating system, allows use of double density with either 5" or 8" drives!, just $207*.

Lowest Prices On Disk Drives!

TEAC 40-track single/double density, single headed (writes, reads on one side of disk), with incredible 1-yr. factory guarantee! Cased, with power supply, ready to plug in and run. Exclusive: no extender cable needed! $275*

80-TRACK, 1-HEADED	$395*
80-TRACK, 2-HEADED (dbl sided)	$550*
Bare 40-track, unpowered	$215*
Bare-80-track	$225*

SOFTWARE to 50% off
Leading brands including Acorn, Allen Gelder, Alternate Source, Apparat, Blechman Enterprises, Breeze Computing, CIE, Data Soft, Dorsett, Edu Ware, Ellis Computing, Hexagon Systems, Micro Clinic, Micro Works, Microsoft, Modular Software, Nepenthe, Personal Computer Service, ProSoft, and Ramware.

BOOKS, leading publishers, 10% off

Discounts:
*prices CIE net, including 10% discount for $50 or more total order, 3 or more items nominal shipping charge on all but books and softwre

CIRCLE 122 ON READER SERVICE CARD

New Products, continued...

32K UPGRADE FOR TRS-80 COLOR COMPUTER

Spectral Associates introduces the Ramcharger, a 32K upgrade module for the TRS-80 Color Computer. The Ramcharger module will extend the memory of a 16K Color Computer to 32K and is compatible with Color Basic.

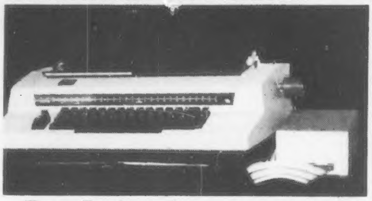
Ramcharger is an assembled and tested printed circuit board which fits inside of the Color Computer and requires no soldering or hardware modifications. This leaves the ROM-PAK port free for other peripherals. $99.95.

Spectral Associates, 141 Harvard Ave., Tacoma, WA 98466. (206) 475-8483.

CIRCLE 356 ON READER SERVICE CARD

PERIPHERALS

CONVERSION FOR ELECTRONIC TYPEWRITER



Escon Products, Inc. announces the EP-567 conversion system which allows computer-controlled operation or any IBM Electronic Typewriter Model 50, 60, or 75.

COMPUTERS BY MAIL
P.O. Box 1805 Hawthorne, CA 90250

PRINTER AND INTERFACES	
ANADEX 9500132 COL	1290.00
ANADEX 9501 132 COL	1290.00
EPSON MX80 PIN FEED	585.00
EPSON MX80 TRACTOR/FRICTION	675.00
EPSON MX70 PIN FEED	405.00
EPSON PARALLEL CARD	65.95
EPSON SERiAL ADAPTOR BOARD	61.95
EPSON CARTRIDGE RIBBON	13.00
EPSON PARALLEL INTERFACE CABLE	21.95
TRENDCOM 200 80 COL	540.00
CENTRONICS 7721 W/O CABLE	95.95
CENTRONICS 7728 W/O CABLE	95.95
CALIFORNIA COMPUTER SYSTEMS	
ASYNCHRONOUS SERIAL	125.95
SYNCHRONOUS SERIAL	139.95
PARALLEL	95.95
MONITORS	
AMDEK 13" COLOR	420.00
AMDEK 12" B & W	150.00
AMDEK 12" 100 GREEN	175.00
SANYO 9" B & W	169.00
SANYO 12" HI - RES B&W	249.00
SANYO 13" COLOR	425.00
SANYO 12" HI-RES GREEN	270.00
NEC 12" COLOR	360.00
MODEMS	
HAYES MICROMODEM II (APPLE II)	295.00
HAYES MICROMODEM 100 (S-100)	315.00
HAYES STACK (RS-232)	239.00
SOUTHEASTERN DATA CAPTURE 4.0	44.95
DISK DRIVES	
MICRO-SCI 40 TRACK W/CONT	460.00
MICRO-SCI 40 TRACK W/O CONT	395.00
EDUCATIONAL SOFTWARE	
EDUWARE	
STATISTICS	24.95
EDU - PAK I	32.95
STORY TELLER	16.95
ALGEBRA I	32.95
UNI - SOLVE	19.95
COMPU - MATH: ARITH SKILL	32.95
COMPU - MATH: FRACTIONS	32.95
COMPU - MATH: DECIMALS	32.95
COMPU - SPELL (REQ. DATA DISK)	24.95
SPACE	24.95
SPACE II	19.95
NETWORK	16.95
TERRORIST	24.95
WINDFALL	16.95
PRISONER	24.95
MICROSOFT TYPING TUTOR	16.95
SUB - LOGIC FLIGHT SIMULATOR	29.95
SYNERGESTIC STAR GAZERS GUIDE	25.95
ACCESSORIES	
DANATRONICS COOLING FAN	39.95
T.G. JOYSTIX	44.95
GAME PADDLES	32.95
80 COLUMN SYSTEMS	
M + R SUPERTERM	24.95
APPLE DOUBLE VISION	235.00
APPLE II 80 COL. VIDEO CARD	315.00
VIDEX VIDEO TERM CARD 80 COL	295.00
MISC HARDWARE	
VIDEX SWITCHPLATE	16.95
KEYBOARD DISPLAY ENHANCER	99.95

	APPLE II 48K +	**$1299.00**
★	**APPLE DISC II DRIVE W/CONT. + 3.3**	**559.95**
★	**XEROX SAM MICROCOMPUTER**	**2595.00**
	MICROPRO WORD STAR	**249.95**
★	**MICROSOFT Z-80 CARD**	**285.00**
	MICROSOFT 16K RAM BOARD	**149.95**
★	**DANATRONICS 16K RAM BOARD**	**126.75**
	MOUNTAIN	
★	**CPS MULTIFUNCTION CRD**	**175.00**
	CPS CABLE	**21.95**

ADVANCE BUSINESS TECHNOLOGY	
10 KEY PAD (OLD OR NEW)	99.95
APPLE CLOCK	239.95
100,000 DAY CLOCK	319.00
SUPERTALKER	254.00
ROMPLUS	129.95
ROMWRITER	145.00
INTROL/X-10 CONTROLLER CARD ONLY	170.00
MUSIC SYSTEM W/SOFTWARE	450.00
A/D D/A W/O CABLE	285.00
I/0 CABLE ASSEMBLY	42.95
BUSINESS SOFTWARE	
PERSONAL SOFTWARE	
DESK TOP PLAN	155.95
CCA DATA MGT	72.95
LJK	
LETTER PERFECT	109.95
CONTINENTAL SOFTWARE	
HOME MONEY MINDER	28.95
CPA I GENERAL LEDGER	177.95
CPA II ACCTS RECEIVABLE	177.95
CPA III ACCTS PAYABLE	177.95
CPA IV PAYROLL	177.95
MUSE SUPER TEXT II	115.00
ADDRESS BOOK	39.95
FORM LETTER MODULE	85.00
STONEWARE DB MASTER (NEW)	179.95
MISCELLANEOUS SOFTWARE	
PERSONAL SOFTWARE	
VISICALC 3.3	155.00
VISIPLOT	149.95
VISIDEX	159.95
VISITERM	119.95
VISITREND/VISIPLOT	210.00
ON-LINE EXPEDITER II	79.95
HAYDEN APPLESOFT COMPILER	159.95
LAZER LOWER CASE ADAPTER	59.95
PAYMAR LOWER CASE REV 7/LATER	39.95
SOLID STATE MUSIC	
AIO SERIAL PARALLEL CARD	160.00
S-100 SYSTEMS	
CALIFORNIA COMPUTER SYSTEMS	
32K STATIC RAM MODULE	650.00
64K STATIC RAM MODULE	560.00
INTEGRATED SYSTEM W/MAINFRAME	1995.00
DISK CONTROLER	300.00
MOTHER BOARD	105.95
4-PORT SERIAL I/O INTERFACE	250.00
Z-80 CPU	259.95

NOTE: COMPLETE SELECTION OF ENTERTAINMENT SOFTWARE AVAILABLE. PLEASE CALL (213) 533-4071

INCLUDE NAME, ADDRESS, PHONE NUMBER, ADD 3% FRT/HANDLING. CALIF. RESIDENTS ADD 6% SALES TAX. ALL MFRS. WARRANTIES APPLY **ALL PRODUCTS IN STOCK!** VISA/MC ADD 3% — INCL. EXP. DATE. PRICES SUBJECT TO CHANGE.
CBM P.O. BOX 1805, HAWTHORNE, CA. 90250
(213) 533-4071

CIRCLE 108 ON READER SERVICE CARD

Computer Games!

How can we tell you about 400 computer games in one advertisement?

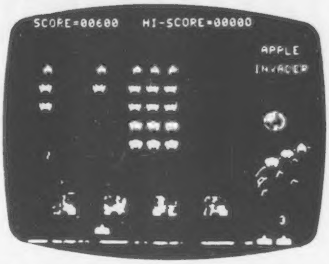
We've got the world's largest line of computer games. Over 400 in all. They're on cassette and disk for eight popular personal computers: Atari, Apple, TI 99/4, PET, TRS-80, Sorcerer, Sol and CP/M.

From A to Z, Action Games to Z-Chess II, we've got loads of best-sellers including "Super Invader" for the Apple, a complete line of six Adventure games, Backgammon, Milestones and Cycle Jump.

Not only that, we publish the best-selling books, *Basic Computer Games* and *More Basic Computer Games* with over 500,000 copies in print.

We've also got a nifty board game, *Computer Rage*, sets of three binary dice, acrobatic toy robots, T-shirts and lots of other goodies.

You'll find comprehensive descriptions of all of our software, books, games and peripherals in our huge 48-page catalog. It's unique in the small computer field. For your free copy, write or call us today or circle our number on the reader service card.



Super Invader features superb high-resolution graphics, nail-biting tension and hilarious antics by the moon creatures.

creative computing

39 East Hanover Ave.
Morris Plains, NJ 07950
Toll-free **800-631-8112**
In NJ 201-540-0445

CIRCLE 300 ON READER SERVICE CARD

CIRCLE 350 ON READER SERVICE CARD

The only thing you can do with a baked Apple is eat it.

The more you stuff your Apple II™ with plug-in boards, the more of a chance it has to overheat.

And once that happens, it won't do anybody any good. Your program bombs and you start losing time and money.

The solution? Simple. Take two minutes to install the Dana Industries fan in the back of your Apple, and you'll practically never have to worry about overheating again.

So pick up the Dana Industries fan at your local computer store. And your Apple will have a long and fruitful life.

™Apple II is a trademark of Apple Computer, Inc.

CIRCLE 195 ON READER SERVICE CARD

---

more . . .
SPECTACULAR OFFERS

BASF **WABASH**
MAXELL **OPUS**

We stock the complete line of BASF diskettes, reel-to-reel tapes, mag cards, disk packs and cartridges. We also carry MAXELL, OPUS and WABASH products. All are 100% certified and fully guaranteed.

Box of 10 diskettes:	5¼"	8"
OPUS ss/sd	$20	$21
BASF ss/sd	23	24
WABASH ss/sd	23	24
MAXELL . TOO LOW TO QUOTE.	CALL	

5¼"-10 sector-now available
Sectoring must be specified.

5¼" or 8" Vinyl Storage Pages .... 10/$5

LIBRARY CASES
8" Kas-sette/10......... **$2.99**
5¼" Mini Kas-sette/10 .. **$2.49**

HARDHOLE DISK PROTECTORS
Reinforcing rings of tough mylar protect disk hole edge from damage.

	5¼"	8"
Applicators	$3	$4
Hardhole Rings (50)	$6	$8

DISK DRIVE HEAD CLEANING KITS
Prevent head crashes and ensure error-free operation.
5¼" or 8" **$19.50**

SFD C-10 CASSETTES .... 10/$7
(All cassettes include box and labels.)
Get 8 cassettes, C-10 Sonic, and Cassette/8 Library-Album, as illustrated, for only **$8**

SNAP-IT POWER CENTER
Turns 1 outlet into 6. Wall mount or portable. Circuit breaker, lighted switch and UL approved.
4"x3"x2" **$19.95**

We also offer printer ribbons, printwheels, type elements, equipment covers, power consoles, paper supplies, storage and filing equipment, furniture and many other accessories for word and data processing systems. Write for our free catalog.

VISA • MASTERCHARGE • MONEY ORDERS • CERTIFIED CHECK • FOR PERSONAL CHECKS ALLOW TWO WEEKS • C.O.D. REQUIRES A 10% DEPOSIT • CAL. RES. ADD 6% SALES TAX • MIN $2 SHIPPING & HANDLING • MINIMUM ORDER $10 • SATISFACTION GUARANTEED OR FULL REFUND

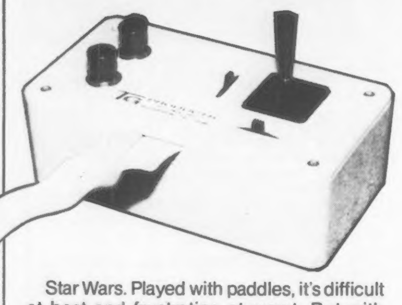
ABM PRODUCTS

8868 CLAIREMONT MESA BLVD
SAN DIEGO, CALIFORNIA 92123

Toll Free 800-854-1555 Order Only
For Information or California Orders
(714) 268-3537

CIRCLE 105 ON READER SERVICE CARD

Why would anyone spend $59.95 for a joystick?



Super Joystick

Star Wars. Played with paddles, it's difficult at best and frustrating at worst. But with a joystick it becomes an entirely new experience. It's still challenging. It's also fun. And very addictive.

Have you ever used a drawing program in which one paddle controls the horizontal movement of the "brush" and the other paddle the vertical? It's slow, tedious work. But with a joystick, drawing is an absolute joy.

Exceptional Precision

The Apple high-resolution screen is divided into a matrix of 160 by 280 pixels. To do precise work on this screen, you need a precise device. Most potentiometers used in paddle controls are not quite linear. If you rotate a paddle control at a constant speed, you'll notice that the cursor speeds up slightly at the beginning and end of the paddle rotation.

The Super Joystick has a pure resistive circuit which is absolutely linear within one tenth of one percent. In other words it would give you precise control over an image of 1000 by 1000 pixels, were such resolution available. Thus it is suitable for high precision professional applications as well as educational and hobbyist ones.

Matched to your application

The Super Joystick also has two external trim adjustments, one for each direction. This allows you to perfectly match the unit to your application and computer. Say you want to work in a square area instead of the rectangular screen. Just reduce the horizontal size with the trim control.

How many times have you played Space Invader and had your thumb ache for hours from the repeated button pressing? This won't happen with the Super Joystick. It's two pushbuttons are big. Moreover, they use massive contact surfaces with a life of well over 1,000,000 contacts. A few games of Super Invader using these big buttons will justify the purchase of the Super Joystick.

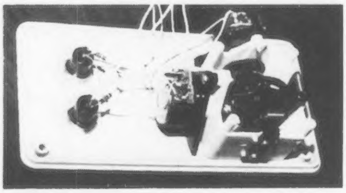
The Super Joystick is self-centering in both directions. That means when you take your hand off it, the control will return to the center. However, if you want it to stay where you leave it, self-centering may be easily disabled.

The Super Joystick plugs right into the paddle control socket and doesn't require an I/O slot.

High-quality construction

The sturdy high-impact molded plastic case of the Super Joystick matches that of the Apple computer. Every component used is the very highest quality available.

We invite your comparison of the Super Joystick with any other unit available. Order it and use it for 30 days. If you're not completely satisfied, return it for a prompt and courteous refund plus your return postage. You can't lose.



By removing two springs, self-centering can be defeated.

The Super Joystick consists of a self-centering, linear joystick, two trim controls, and two pushbuttons mounted in an attractive case. It comes complete with instructions and a 90-day limited warranty. Cost is $59.95.

Order Today

To order the Super Joystick send $59.95 plus $2.00 postage and handling (NJ residents add $3.00 sales tax) to our address below.

Experience the joys of using the world's finest joystick. Order your Super Joystick at no obligation today.

Peripherals Plus

39 East Hanover Ave.
Morris Plains, NJ 07950
Toll-free **800-631-8112**
(In NJ 201-540-0445)

CIRCLE 239 ON READER SERVICE CARD

New Products, continued...

A single-board computer is the heart of the system, giving the user full control of all typewriter operations, including "code" functions. Speed is retained at maximum, 15-1/2 cps. RS-232 and Parallel computer input is accommodated in the standard package, with an adapter to IEEE-488 available as an option.

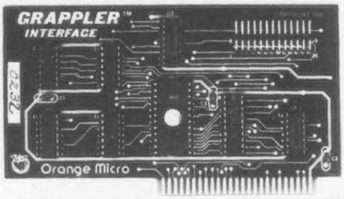
A 96-character buffer is used for incoming character storage, with various handshaking protocols accommodated. RS-232 baud rates are switch selectable from 110 to 9600.

Price of the system is $435 for the RS-232/Parallel, $535 for IEEE-488.

Escon Products, Inc., 12919 Alcosta Blvd., San Ramon, CA 94583. (415) 820-1256.

CIRCLE 357 ON READER SERVICE CARD

APPLE PARALLEL INTERFACE



The Grappler is a Centronics-compatible parallel interface for the Apple II and Apple II Plus computers which features on-board firmware to copy the Apple high-resolution graphics screen to many popular graphics printers.

It also features text commands, including text screen dumps, setting of margins and page lengths, auto-skip-over perforation and word wrap-around with breakpoint on nearest blank.

The Grappler interface is compatible with Apple Pascal and CP/M, and currently supports Anadex, IDS Paper Tiger, Centronics 739, Epson MX70 and MX100 printers. It also supports Epson MX80 and MX80/FT printers with the Graftrax-80 graphics upgrade installed.

Orange Micro, 3150 E. LaPalma #I, Anaheim, CA 92806. (800) 854-8275 or (714) 630-3322.

CIRCLE 358 ON READER SERVICE CARD

TRS-80 JOYSTICK INTERFACE

Joy-6 is a joystick interface for TRS-80 Models I and III, featuring potentiometer-type joysticks with pushbuttons, sound effects capability, and simple control software. It can also be used as a general purpose six-channel analog to digital converter with temperature sensors or other transducers and can drive an external relay for control applications.

The complete package includes Joy-6, two joysticks with pushbuttons, power

Unwrap the Crypto Mystery for $495.

Thanks to the Western Digital CryptoPrimer™ Development Kit, cryptography is no longer a deep, dark secret. In fact, the kit is specially designed for personal computer owners and is based on the National Bureau of Standards' data encryption algorithm. Included in the kit are: a CryptoPrimer™ manual, a cryptographic system built around our WD 2001/2 data encryption chip, a convenient RS 232 connector and a special hardware manual. All for just $495. Best of all, you'll end up with more than a clue on how to implement all the benefits of data encryption. So send your check or money order (including $9.00 for shipping and 6% sales tax if you're a California resident) to: Western Digital, 2445 McCabe Way, Irvine, CA 92714. Please also specify your computer's make and model number.

CRYPTO PRIMER USER'S MANUAL
WESTERN DIGITAL
CryptoPrimer
WESTERN DIGITAL

We think keeping cryptography a mystery is a crime.

Making the leading edge work for you.

WESTERN DIGITAL
C O R P O R A T I O N

Telecommunications Division
2445 McCabe Way, Irvine, CA 92714
(714) 557-3550

CIRCLE 180 ON READER SERVICE CARD

PROGRAMMING TOOLS FOR YOUR TRS-80™

INSTANT ASSEMBLER

The INSTANT ASSEMBLER is a new, powerful tape-based assembler and debugger for the TRS-80. Now you can assemble directly to memory and immediately debug your program with the built in single stepping debugger. Quickly switch from assembler to debugger and back again without losing the source code. This feature makes INSTANT ASSEMBLER an excellent learning tool for assembly language programming.

INSTANT ASSEMBLER is absolutely unique among tape based assemblers in that it produces relocatable code modules that can be linked with the separate LINKING LOADER, which is supplied in two versions for loading programs into either high or low RAM. This lets you build long programs with small modules. INSTANT ASSEMBLER also features immediate detection of errors as the source code is entered, a compactly coded source format that uses 1/3 as much memory as standard source, and many operational features including single stroke entry of DEFB and DEFW, pinpoint control of listings, alphabetic listing of symbol table, separate commands for listing error lines or the symbol table, block move function, and verification of source tapes.

INSTANT ASSEMBLER's debugger provides single stepping with full register displays, decimal or hex entry of addresses, forward or backward memory displays, disassembly of object code in memory, memory display in ASCII format, and hex-to-decimal or decimal-to-hex conversion. The single-stepper will step one instruction at a time or at a fast rate to any defined address.

INSTANT ASSEMBLER occupies less than 8400 bytes of memory. In a 16K machine this will leave you enough memory to write assembly language programs of around 2000 bytes. This and its module-linking feature make INSTANT ASSEMBLER ideal for users with only 16K machines. The instruction manual may be purchased separately for $3, which will apply towards the purchase of the INSTANT ASSEMBLER.

Specify Model I or Model III. INTASM.....$29.95

SINGLE STEP THROUGH RAM OR ROM

STEP80 allows you to step through any machine language program one instruction at a time, and see the address, hexadecimal value, Zilog mnemonic, register contents, and step count for each instruction. The top 14 lines of the video screen are left unaltered so that the 'target program' may perform its display functions unobstructed. STEP80 will follow program flow right into the ROMs, and is an invaluable aid in learning how the ROM routines function. Commands include step (trace), disassemble, run in step mode at variable step rate, display or alter memory or CPU registers, jump to memory location, execute a CALL, set breakpoints in RAM or ROM, write SYSTEM tapes, and relocate to any page in RAM. The display may also be routed to your line printer through the device control block so custom print drivers are automatically supported.

Specify Model I or Model III. STEP80.....$16.95

TELECOMMUNICATIONS PROGRAM

This machine language program may be used as a smart terminal with time share systems or for high speed file transfers between two disk-based micros over modems or direct wire. It is menu driven and extremely simple to use. Functions include real-time terminal mode, save RAM buffer on disk, transmit disk file, receive binary files, examine and modify UART parameters, program 8 custom log-on messages, automatic 16-bit checksum verification of accurate transmission and reception, and many more user conveniences. Supports line printers and lowercase characters. With this program you will no longer need to convert machine language programs to ASCII for transmission, and you will know immediately if the transmission was accurate. This program comes on a formatted disk.

Specify Model I or Model III. TELCOM.....$39.95

PROGRAM INDEX VERSION 2.0

Assemble an alphabetized index of your entire program library from disk directories. Program names and free space are read automatically (need not be typed in) and may be alphabetized by disk or program. The list may also be searched for any disk, program, or extension; disks or programs added or deleted; and the whole list or any part sent to the printer. Printer output may be requested in three different formats including labels. The list itself may also be stored on disk for future access and update. It also includes a PURGE mode for quickly killing unwanted files. Directory reads and alphabetizing is done in machine code for speed. 1,000 programs may be sorted in less than 10 seconds. Works with TRSDOS, NEWDOS, and NEWDOS/80 single or double density. One drive and 32K required.

Specify Model I or Model III. INDEX.....$24.95

DUPLICATE SYSTEM TAPES WITH CLONE

Make duplicate copies of any tape written for Level II. They may be SYSTEM tapes or data lists. The file name, load address, entry point, and every byte (in ASCII format) are displayed on the video screen. Model III version allows changing tape speed.

Specify Model I or Model III. CLONE.....$16.95

ORDERING: Complete satisfaction is guaranteed or a full refund will be made. All programs (except TELCOM) are shipped on cassette unless $5 is included for a formatted (no system) disk. Include $1.50 for postage and handling. California residents add 6% sales tax. Visa, Mastercharge and COD orders accepted. **SPECIFY MODEL I OR MODEL III.** Dealer inquiries invited!

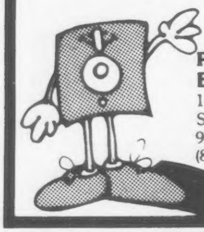
MUMFORD MICRO SYSTEMS

Box 400-A Summerland, California 93067 (805) 969-4557

CIRCLE 313 ON READER SERVICE CARD

Dysan
CORPORATION

Solve your disc problems, buy 100% surface tested Dysan diskettes. All orders shipped from stock, within 24 hours. Call toll FREE (800) 235-4137 for prices and information. Visa and Master Card accepted.



PACIFIC EXCHANGES
100 Foothill Blvd.
San Luis Obispo. CA
93401. (In Cal. call
(805) 543-1037.)

CIRCLE 169 ON READER SERVICE CARD

**You can pay more —
But you can't get more!**

Model III 16K
$839
Model III 48K
2 disc & RS232C
$2100

Color Computer 4K
$310
w/16K Ext. Basic
$459

BUY DIRECT. These are just a few of our great offers which include Printers, Modems, Computers, Peripherals, Disc Drives, Software and more. call TOLL FREE 1-800-343-8124

We have the lowest possible fully warranteed prices and a full complement of Radio Shack Software.

computer plus
Write for your free catalog.
**245A Great Road
Littleton, MA 01460
617 • 486 • 3193**

CIRCLE 124 ON READER SERVICE CARD

Converse with your Computer
ELIZA
Play it — Program it

More than just a computerized "psychiatrist," this **new expanded implementation of ELIZA**, the world-renowned artificial intelligence demonstration program, brings to your micro the full capability of the original — and then some.

ELIZA converses with you in plain English, responding to your comments. Plus, it lets you modify its responses, and add new phrases to its repertoire. You can even create an entirely new set of conversational gambits on any topic you choose.

ELIZA comes with the original non-directive psychiatrist "script" developed at MIT. Documentation includes a copy of the original research paper, plus full instructions on how to program ELIZA's responses.

ELIZA requires 40K RAM and costs only $24.95.
Specify: 8" **CP/M** disk
5" Heath/Zenith disk

Add $3 shipping and handling, $2 for 5" disks, $5 for overseas. CA residents add sales tax.

The Software Toolworks
14478 Glorietta
Sherman Oaks, CA 91423
(213) 986-4885
Circle reader service number for complete catalog.
CIRCLE 167 ON READER SERVICE CARD

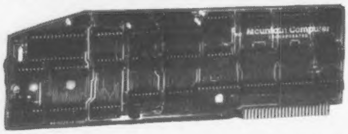
New Products, continued...

supply, user's manual, and a 16K Level II machine language cassette with six joystick games. The Model III requires an adaptor cable. $124.95. A kit is available for $99.95.

Mega Systems Inc., 262 Park Lane, King of Prussia, PA 19406. (215) 337-3876.

CIRCLE 359 ON READER SERVICE CARD

MULTIFUNCTION CARD AND RS-32 ADAPTER FOR APPLE II



The Mountain Computer CPS MultiFunction Card provides the capabilities of a serial interface, parallel output interface and real-time calendar/clock on one card. Serial and parallel output may be used simultaneously from CPS.

CPS is configured from a set-up program on diskette which sets the parameters (such as baud rate, etc.) for all functions contained on the card and is stored in CMOS RAM on the card.

Mountain Computer Inc. also announces the RS-232 DB25 Pin Reconfiguration Adapter. Consisting of a printed circuit card with one male and one female DB25 connector mounted on it and incorporating a special "matrix switch," this device enables users to mate almost any serial I/O device to any computer by rerouting RS-232C signals.

The PRA eliminates the task of fabricating special cables or resoldering existing cable wiring to achieve signal interfaces between a computer and peripheral I/O device, such as a modem, printer or terminal. A simple flat cable with DB25 connectors and the PRA adapter ties the proper signal lines together. $59.95.

Mountain Computer Inc., 300 El Pueblo Rd., Scotts Valley, CA 95066. (408) 436-6650.

CIRCLE 360 ON READER SERVICE CARD

DISK SYSTEMS

DISK DRIVES FOR H-89, H-8

Percom Data Company has announced add-on drives for Heath H-89 and H-8 computers.

Both 40- and 80-track versions of the "Z" drives are available and may be ordered in either one- or two-drive modules.

OMEGA MICRO
NUMERIC KEYPAD FOR APPLE II

MODEL KVAII
18 KEY KEYPAD

APPLE OWNERS
Add the Omega Micro 18-Key Numeric Keypad now for **easier** and faster number entry.

- No soldering: Plug-in installation
- Seven popular function keys
- Uses no I/O expansion slots
- Fully hardware & software compatible — even with Visicalc

AVAILABLE NOW — sugg. list $199.

SEE IT AT YOUR DEALER
OR WRITE FOR FREE BROCHURE

OMEGA MICRO
215 W. 1st., Ste. 105-61
Tustin, CA 92680
714—730-1463

CIRCLE 155 ON READER SERVICE CARD

COTTAGE SOFTWARE

PACKER: Machine language program that edits all or part of your Basic program to run faster, save memory, or ease editing. The 5 options include UNPACK—unpacks multiple statement lines into single statements maintaining logic inserts spaces and renumbers lines. SHORT—deletes unnecessary words, spaces, and REM statements. PACK—packs lines into maximum multiple statement lines, maintaining program logic. RENUM—renumbers lines, including all branches. MOVE—moves line or blocks of lines to any new location in program. On 2 cassettes for 16K, 32K, & 48K. For TRS-80™ Mod I or III Level II or Disk Basic............$29.95

SYSTEM TAPE DUPLICATOR: Copy your SYSTEM format tapes. Includes verify routines. The Model III version allows use of both 500 and 1500 baud cassette speeds.
For TRS-80™ Model I or III Level II..........$15.95

CASSETTE LABEL MAKER: A mini word processor to print cassette labels on a line printer. Includes 50 peel-and-stick labels on tractor feed paper.
For TRS-80™ Model I or III Level II & Printer .$17.95

PRINT TO LPRINT TO PRINT: Edits your Basic program in seconds to change all Prints to LPrints (except Print@ or Print#) or LPrints to Prints. Save edited version.
For TRS-80™ Model I or III Level II..........$12.95

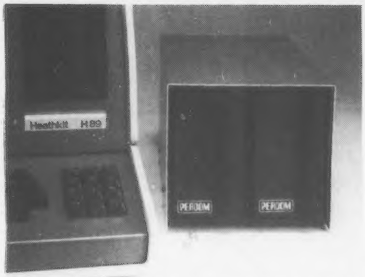
FAST SORTING ROUTINES: For use with Radio Shack's Accounts Receivable, Inventory Control I, and Disk Mailing List Systems for Model I Level II. Sorts in SECONDS! You'll be amazed at the time they can save. Supplied on data diskette with complete instructions.
FAST SORT for Accounts Receivable......$19.95
FAST SORT for Inventory Control I........$19.95
FAST SORT for Disk Mailing List (specify data diskette cassette for 1 drive system).............$14.95
ALL THREE ROUTINES..................$44.95

Prices subject to change without notice. Call or write for complete catalog. Dealer inquiries invited. VISA and MasterCard accepted. Foreign orders in US currency only. Kansas residents add 3% sales tax. On-line catalog on Wichita FORUM-80: 316-682-2113 Or call our 24 hour phone 316-683-4811 or write:

COTTAGE SOFTWARE
614 N. Harding Wichita, KS 67208

TRS-80 is a trademark of Tandy Corporation

CIRCLE 161 ON READER SERVICE CARD



The 40-track drives work with all H-89/H-8 software, while 80-track units support HDOS programs after a minor change to the Heath disk-operating system is made. $399.

Percom Data Company, 211 N. Kirby, Garland, TX 75042. 800-527-1592.

CIRCLE 361 ON READER SERVICE CARD

FLOPPY DISK SYSTEM FOR PET

CGRS Microtech, Inc. introduces a floppy disk system for the Commodore PET series of computers.

Pedisk II can be purchased with 5 1/4" or 8" disk drives. A small 2 1/2" x 5" disk controller board mounts inside the machine

---

SORCERER SOFTWARE

SUPER ASTEROIDS by Apollo

'A new era in real time graphic arcade games'.

Never has there been such a captivating and superbly written arcade game for the Sorcerer. Styled after the well known and very popular ASTEROID DELUXE arcade game, SUPER ASTEROIDS is destined to become the most popular piece of demonstration software used by dealers and users alike. Perhaps it is the outstanding use of fine line graphics or the silky smooth movement. Maybe it is the breathtaking speed, dazzling explosions, gripping sound effects or simply the challenge of avoiding those fire balls from that persistent flying saucer that insidiously follows you across the screen. Whatever it is, we warn you NOT to purchase this game for fear that you may join the ranks of hundreds of other ASTEROID Addicts who, square and bleary eyed at 3 am, just MUST have ONE more go at trying to beat that High Score.

The object is to guide a small space ship across the screen avoiding but shooting asteroids as they glide past. When an asteroid is hit, it will break up into many smaller pieces. By repeatedly hitting the pieces they will soon disintergrate and disappear. If you crash your ship into an asteroid it will break into pieces and splinter across the screen in a shower of sparks! However, if you manage to stay in one piece, chances are you'll soon be pursued by a flying saucer that shoots balls of fire! Best that you treat him with care, else you may make his friends VERY aggressive.

Apollo has used a novel but ingenius method of continually reprogramming graphics characters and has obtained stunning results! All movement is done pixel by pixel but without speed loss. Numbers of asteroids, directions, speeds and such like are all totally unpredictable. If you can show us a piece of software that has finer, smoother and faster graphics than SUPER ASTEROIDS, we guarantee to refund your money in full!

Cassette $29.95

ZAP80 'Secret Code Disassembler'. by Ian Robinson

This is far from your average run-of-the-mill disassembler! Other than being a mere 4K long, able to disassemble at the speed of light and packed with options, ZAP80 will display before your very eyes all those unknown instructions ZILOG never talk about! Ian has been doing extensive research into the actions of the Z80 processor when confronted with the 700 or so undocumented (and so called 'illegal') code sequences. Over 100 of these are VERY useful! Did you know you have extra 8 bit registers and a complete set of instructions to manipulate them? Did you know about extra rotate instructions?

ZAP80 will disassemble ANY code sequence. Nothing is illegal! It will allow you to program with codes that no other disassembler can decipher! Think about that ....

ZAP80 comes with documentation and explanation of all new mnemonics used. Three versions are supplied that reside in low, mid and high memory. Options include ASCII output, screen pause and customised printer control.

Whether you are a serious programmer, a beginner or simply curious, ZAP80 is a piece of software you must have. Come and play a REAL adventure game!

Cassette $24.95

HOW TO ORDER:

ALL PRICES ARE IN AUSTRALIAN DOLLARS. One Australian dollar equals 1.16 American and 1.4 Canadian. All programs come standard on cassette but some may be requested on either Micropolis II Quad density or VISTA 5¼" diskettes for an additional cost of $5.00 per diskette. Note that more than one program will fit on a diskette. Programs available or diskette include CIRCUS, GALAXIANS, GROTNIK WARS and ZAP80.

$2 discount if this form is used. (Photostat will suffice).

PROGRAM	PRICE
Postage within Australia is $1 for initial item and 50c for each additional. Outside Australia is $2 and 50c.	
Less $2 Discount	$2.00
TOTAL	

I enclose,

(a) Cheque or money order for the above amount, or

(b) My credit card, expiry date ....
(Master Charge, Visa, Bankcard, American Express, Diners Club)

No. ....

My name and address:

NAME: ....

STREET: ....

TOWN/CITY: ....

POSTCODE: ...... COUNTRY: .....

POST THE ABOVE FORM TO:

SYSTEM SOFTWARE
1 KENT STREET, BICTON
WESTERN AUSTRALIA 6157
TELEPHONE: ISD (619) STD (09) 339 3842
Sunday through to Friday.
Ask for Richard Swannell for personal service.

We are a dynamic Western Australian enterprise whoe sole aim is to bring you the best in Sorcerer software.

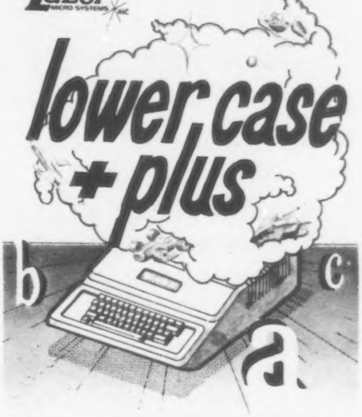
A catalogue such as this is produced regularly and sent to approximately 2000 interested Sorcerer users in all parts of the world. Let us know if you wish to be included on our mailing list.

CIRCLE 192 ON READER SERVICE CARD

---

the BEST
lower case adapter

Lazer MICRO SYSTEMS INC



GRAPHICS & LOWER CASE CHARACTER GENERATOR FOR THE APPLE II COMPUTER

$69.95

--AND--

the BEST
keyboard buffer

Lazer MICRO SYSTEMS INC

keyboard+ plus
BY: LAZER MICRO SYSTEMS
LOWER CASE a,b,c
SHIFT R
SHIFT U
STOP
KEYBOARD BUFFER

& SHIFT KEY UPPER/LOWER CASE CONTROL

$119.95

Separately, they have more features and out perform all the rest. But together as a team they perform even better. Look for the Graphics +Plus soon. It's a RAM based character generator to compliment the Lower Case +Plus. Send for our free booklet "Lower case adapters and keyboard buffers from the inside, out".

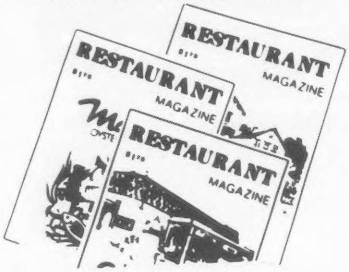
Lazer MICRO SYSTEMS INC.
1791-G Capital
Corona, CA 91720
(714)735-1041

CIRCLE 295 ON READER SERVICE CARD

RESTAURANT
MAGAZINE

#1 With More Restaurant News and Information Than Any Other Magazine. Page after Page of Restaurant Reviews with Photographs. Menu Selections. Prices. House Specialties. And The Reviewers Impartial Opinions Plus Many Letters From The Dining Out Public About Their All Time Favorites And New Discoveries. A One Of A Kind Publication That Has No Peers.

SAVE 50% OFF
COVER PRICE OF $1.75
12 ISSUES FOR $10.00
PLUS FREE
MASTERCHEFS
COOKBOOK
Retail Value $12.50
LEARN THE
TECHNIQUES OF WORLD-
FAMOUS CHEFS



YES, PLEASE SEND ME 12 MONTHLY ISSUES OF RESTAURANT MAGAZINE AND THE MASTER CHEFS COOKBOOK—BOTH FOR ONLY $10.00.

Name____________________________________
Address __________________________________
City______________ State__________ Zip________

Mail this card and enclose $10.00 to
RESTAURANT MAGAZINE, 806 S. Robertson, LA., CA 90035

CIRCLE 166 ON READER SERVICE CARD

New Products, continued...

and contains the PDOS software ROM and all the disk control circuitry.

One, two, or three drives connect to the Pedisk II controller board. The single drive 5 1/4" system retails for $595 and offers 143K bytes of storage. The dual drive 5 1/4" quad density system provides 572K bytes of high speed storage and retails for $1195.

CGRS Microtech, Inc., P.O. Box 102, Langhorne, PA 19047. (215) 757-0284.

CIRCLE 362 ON READER SERVICE CARD

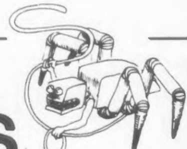
DISK SUBSYSTEMS FOR PERSONAL COMPUTERS

Matchless Systems introduces the MX-800C, a disk subsystem compatible with Heath/Zenith 89, Apple II, TRS-80 Model II and all S-100-based computers.

The subsystem includes case, power supply, fan, cables and a choice of four different drive configurations: one single-sided drive ($1050), two single-sided drives ($1595), one double-sided drive ($1395), and two double-sided drives ($2095). Single/double density controllers and software are available at additional cost.

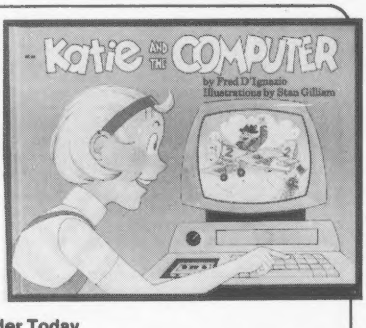
Matchless Systems, 18444 South Broadway, Gardena, CA 90248. (213) 327-1010.

CIRCLE 363 ON READER SERVICE CARD



new friends for your child...

Katie and the Computer



Fred D'Ignazio and Stan Gilliam have created a delightful picture book adventure that explains how a computer works to a child. Katie "falls" into the imaginary land of Cybernia inside her Daddy's home computer. Her journey parallels the path of a simple command through the stages of processing in a computer, thus explaining the fundamentals of computer operation to 4 to 10 year olds. Supplemental explanatory information on computers, bytes, hardware and software is contained in the front and back end papers.

Thrill with your chidren as they join the Flower Bytes on a bobsled race to the CPU. Share Katie's excitement as she encounters the multi-legged and mean Bug who lassoes her plane and spins her into a terrifying loop. Laugh at the madcap race she takes with the Flower Painters by bus to the CRT.

"Towards a higher goal, the book teaches the rewards of absorbing the carefully-written word and anticipating the next page with enthusiasm..."
The Leader

"Children might not suspect at first there's a method to all this madness—a lesson about how computers work. It does its job well."
The Charlotte Observer

"...the book is both entertaining and educational."
Infosystems

Order Today
Katie and the Computer is hardbound, illustrated in full color throughout and costs just $6.95. A T-Shirt picturing the program bug in the story is also available (purple bug on a beige shirt). Shirts are available in adult S, M, L, XL, children's S, M and L and cost just $6.00.

To order send payment plus $2.00 postage and handling per order to the address below.

creative computing

39 E. Hanover Avenue
Morris Plains, NJ 07950
Toll-free **800-631-8112**
In NJ 201-540-0445

CIRCLE 350 ON READER SERVICE CARD

MISCELLANEOUS

LEARNING SYSTEM OFFERS INTERACTIVE VIDEO CAPABILITIES

Coloney Productions announces Carrel, a custom-built student learning station.

The system includes a 48K Apple II Plus computer, disk drive, laser reflective videodisc player, 12" color monitor, audio amplifier, stereo speakers, and the Coloney interface package housed in a fiberglass and wood carrel.

The interface package consists of a videodisc control card, video switching and junction box, cables, operating software in Basic and Pascal, and system documentation. The interface switches the computer and videodisc output to a single monitor where they can be combined in Computer Assisted Instruction applications.

The complete system sells for $6500. The carrel is available separately for $800.

Coloney Productions, 1248 Blountstown Hwy., Tallahassee, FL 32304. (904) 575-0691.

CIRCLE 364 ON READER SERVICE CARD

"Damn the rescue, man! Did you bring me any new programs?"

FREE
with software purchase—
One CPM Handbook

Ad#20 **DISCOUNT SOFTWARE**

ULTIMATE SOFTWARE PLAN

We'll match any advertised price on any item that we carry. And if you find a lower price on what you bought within 30 days of buying it, just show us the ad and we'll refund the difference.

It's that simple.

Combine our price protection with the availability of full professional support and our automatic update service and you have the Ultimate Software Plan.

It's a convenient, uncomplicated, logical way to get your software.

✓ (New items or new prices)
CP/M users:
specify disk systems and formats. Most formats available.

CP/M®	DISK WITH MANUAL / MANUAL ONLY
ARTIFICIAL INTELLIGENCE	
Medical(PAS-3)	$849/$40
Dental (PAS-3)	$849/$40
ASYST DESIGN	
Prof Time Accounting	$549/$40
General Subroutine	$269/$40
Application Utilities	$439/$40
COMPLETE BUS. SYSTEMS	
Creator	$269/$25
Reporter	$169/$20
Both	$399/$45
COMPUTER CONTROL	
Fabs (B-tree)	$159/$20
UltraSort II	$159/$25
COMPUTER PATHWAYS	
Pearl (level 1)	$ 99/$25
Pearl (level 2)	$299/$40
Pearl (level 3)	$549/$50
DIGITAL RESEARCH	
CP/M 2.2	
NorthStar	$149/$25
TRS-80 Model II (P+T)	$159/$35
Micropolis	$169/$25
Cromemco	$189/$25
PL/I-80	$459/$35
BT-80	$179/$30
Mac	$ 85/$15
Sid	$ 65/$15
Z-Sid	$ 90/$15
Tex	$ 90/$15
DeSpool	$ 50/$10
✓ CB-80	$459/$35
✓ CBasic-2	$ 98/$20
D.M.A.	
Ascum	$149/$15
DMA-DOS	$179/$35
CBS	$369/$45
Formula	$539/$45
GRAHAM-DORIAN	
General Ledger	$729/$40
Acct Receivable	$729/$40
Acct Payable	$729/$40
Job Costing	$729/$40
Payroll II	$729/$40
Inventory II	$729/$40
Payroll	$493/$40
Inventory	$493/$40
Cash Register	$493/$40
Apartment Mgt	$493/$40
MICRO-AP	
S-Basic	$269/$25
Selector IV	$469/$35
MICRO DATA BASE SYSTEMS	
HDBS	$269/$35
MDBS	$795/$40
DRS or QRS or RTL	$269/$10
MDBS PKG	$1295/$60
MICROPRO	
WordStar	$319/$60
Customization Notes	$ 89/$na
Mail-Merge	$109/$25
WordStar/Mail-Merge	$419/$85
DataStar	$249/$60
WordMaster	$119/$40
SuperSort I	$199/$40
Spell Star	$175/$40
MICROSOFT	
Basic-80	$289
Basic Compiler	$329
Fortran-80	$349
Cobol-80	$574
M-Sort	$124
Macro-80	$144
Edit-80	$ 84
MuSimp/MuMath	$224
MuLisp-80	$174

MICROTAX	
✓ Individual	$250
✓ Professional	$1000
✓ Partnership	$750
✓ Package	$1500
ORGANIC SOFTWARE	
TextWriter III	$111/$25
DateBook II	$269/$25
Milestone	$269/$30
OSBORNE	
General Ledger	$ 59/$20
Acct Rec/Acct Pay	$ 59/$20
Payroll w/Cost	$ 59/$20
All 3	$129/$60
All 3 + CBASIC-2	$199/$75
Enhanced Osborne	$269/$60
With "C" Basic	$349/$75
PEACHTREE	
General Ledger	$399/$40
Acct Receivable	$399/$40
Acct Payable	$399/$40
Payroll	$399/$40
Inventory	$399/$40
Surveyor	$399/$40
Property Mgt	$799/$40
CPA Client Write-up	$799/$40
P5 Version	Add $129
SOFTWARE WORKS	
Adapt (CDOS to CP/M)	$ 69/$na
Ratfor	$ 86/$na
SOHO GROUP	
MatchMaker	$ 97/$20
WorkSheet	$177/$20
STRUCTURED SYSTEMS	
✓ GL or AR or AP or Pay	$849/$40
✓ Inventory Control	$849/$40
Analyst	$199/$25
Letteright	$179/$25
QSort	$ 89/$20
NAD	$ 87/$20
SUPERSOFT	
Diagnostic I	$ 49/$20
Diagnostic II	$ 84/$20
Disk Doctor	$ 84/$20
Forth (8080 or Z80)	$149/$30
Fortran	$219/$30
Fortran w/Ratfor	$289/$35
✓ C Compiler	$174/$20
✓ Star Edit	$189/$30
Other	less 10%
TCS	
GL or AR or AP or Pay	$ 79/$25
All 4	$269/$99
Compiled each	$ 99/$25
UNICORN	
Mince	$149/$25
Scribble	$149/$25
Both	$249/$50
WHITESMITHS	
"C" Compiler	$600/$30
Pascal (incl "C")	$850/$45
"DATA BASE"	
FMS-80	$649/$45
✓ dBASE II	$595/$50
Condor II	$899/$50
✓ Access 80 Level 1	$249
✓ Access 80 Level 2	$429
✓ Access 80 Level 3	$679
Optimum	$749/$50

"PASCAL"	
Pascal/MT+	$429/$30
Pascal/Z	$349/$30
Pascal/UCSD 4.0	$429/$50
Pascal/M	$189/$20
"WORD PROCESSING"	
WordSearch	$179/$50
SpellGuard	$229/$25
VTS/80	$259/$65
Magic Wand	$289/$45
Spell Binder	$349/$45
"OTHER GOODIES"	
Select	$269/$na
Forecaster	$199/$na
✓ Micro Plan	$419/$na
✓ The Last One	$549/$na
SuperCalc	$269/$50
Target	$189/$30
BSTAM	$149/$15
BSTMS	$149/$15
Tiny "C"	$ 89/$50
Tiny "C" Compiler	$229/$50
Nevada Cobol	$129/$25
MicroStat	$224/$25
Vedit	$105/$15
MiniModel	$449/$50
StatPak	$449/$40
Micro B+	$229/$20
Raid	$224/$35
String/80	$ 84/$20
String/80 (source)	$279/$na
ISIS II	$199/$50
Plan 80	$269/$30

APPLE II®	
INFO UNLIMITED	
✓ EasyWriter	$199
✓ Datadex	$249
Other	less 15%
MICROSOFT	
✓ Softcard (Z-80 CP/M)	$279
Fortran	$179
Cobol	$499
✓ Tasc	$139
MICROPRO	
Wordstar	$269
MailMerge	$ 99
Wordstar/MailMerge	$349
SuperSort I	$159
✓ Spellstar	$129
PERSONAL SOFTWARE	
Visicalc 3.3	$159
Desktop/Plan II	$159
Visiterm	$129
Visidex	$159
Visiplot	$149
Visitrend/Visiplot	$229
✓ Visifile	$199
PEACHTREE	
General Ledger	$224/$40
Acct Receivable	$224/$40
Acct Payable	$224/$40
Payroll	$224/$40
Inventory	$224/$40
"OTHER GOODIES"	
✓ dBASE II	$595/$50
VU #3R (use w/Visicalc)	$ 79
Context Connector (use w/Visicalc)	$129
Micro Courier	$219
TCS Apple (complete business)	$269/$99
Super-Text II	$127
Data Factory	$134
DB Master	$184
Charles Mann	less 15%
STC	less 15%

ORDERS ONLY—CALL TOLL FREE VISA • MASTERCHARGE

1-800-854-2003 ext. **823** • **Calif. 1-800-522-1500** ext. **823**

Overseas—add $10 plus additional postage • Add $2.50 postage and handling per each item • California residents add 6% sales tax • Allow 2 weeks on checks, C.O.D. ok • Prices subject to change without notice. All items subject to availability • ® — Mfgs. Trademark.

THE DISCOUNT SOFTWARE GROUP
6520 Selma Ave. Suite 309 • Los Angeles, Ca. 90028 • (213) 837-5141
Int'l TELEX 499-0032 BVHL Attn: DiscSoft • USA TELEX 194-634 BVHL Attn: DiscSoft •
TWX 910-321-3597 BVHL Attn: DiscSoft

CIRCLE 131 ON READER SERVICE CARD

computer store of the month

Computer Center, New York

Numerous computer stores sell Creative Computing Magazine, Press, and Software. In this issue we are spotlighting Computer Center, N.Y. We would like to recognize their salesmanship, success and service to the community.

No visit to the "Big Apple" would be complete without a visit to the Computer Center, one of New York's fastest growing computer chains. The management team at the Computer Center believes in customer support and education and interested beginners and visitors alike browse in a relaxed atmosphere. Due to the free advice and information provided, most customers "get involved" with the store because of the attention they receive and desire for additional knowledge.

Futuristic decor in the store lends visual appeal that touches everything from mirrored walls to the brightly lit display units that bring together the largest selection of computer software and "state of the art" technology in the country today. With something for everyone, the product lines include Creative Computing Magazine, Press, and Software as well as Cromemco, Hewlett Packard, NEC, Atari and Apple.

The Computer Centers are located at 31 East 31st Street and 480 Madison Avenue and a third store presently being planned is due to open late this year. The New York phone number is (212) 889-8130, from outside New York you can call toll free (800) 221-3144. If you are ever in New York, stop in and see them.

MOUNTAIN SOFTWARE

ATARI
A Warner Communications Company

ADVENTURE INTERNATIONAL

#1 Adventureland (Cass)	$ 19.95	Now	16.50
#2 Pirates Adventure (Cass)	$ 19.95	Now	16.50
#3 Mission Imposs. (Cass)	$ 19.95	Now	16.50
#4 Voodoo Castle (Cass)	$ 19.95	Now	16.50
#5 The Count (Cass)	$ 19.95	Now	16.50
#6 Strange Odyssey (Cass)	$ 19.95	Now	16.50
#7 Mystery Fun House (Cass)	$ 19.95	Now	16.50
#8 Pyramid of Doom (Cass)	$ 19.95	Now	16.50
#9 Ghost Town (Cass)	$ 19.95	Now	16.50
#10 Savage Island (Cass)	$ 19.95	Now	16.50
#11 Savage Island II (Cass)	$ 19.95	Now	16.50
#12 Golden Voyage (Cass)	$ 19.95	Now	16.50
Adventures 1-12 (Cass)	$100.00	Now	87.50
Lunar Lander (Cass)	$ 14.95	Now	13.50
Star Trek 3.5 (Cass)	$ 19.95	Now	16.50
Galactic Empire (Cass)	$ 19.95	Now	16.50

AUTOMATED SIMULATIONS

Datestones of Ryn (Cass)	$ 19.95	Now	16.50
Invasion Orion (Cass)	$ 24.95	Now	20.50
Morlocs Tower (Cass)	$ 19.95	Now	16.50
Rescue at Rigel (Cass)	$ 29.95	Now	24.50

ATARI

Basic (Rom)	$ 60.00	Now	47.50
Word Processor (Disk)	$150.00	Now	119.50
Basketball (Rom)	$ 30.00	Now	24.50
Asteroids (Rom)	$ 40.00	Now	32.50
Star Raiders (Rom)	$ 40.00	Now	32.50
Space Invaders (Cass)	$ 20.00	Now	16.00
Education-Master (Rom)	$ 25.00	Now	20.50
Economics (Cass)	$ 30.00	Now	24.50
Spelling (Cass)	$ 30.00	Now	24.50
Physics (Cass)	$ 30.00	Now	24.50
U.S. History (Cass)	$ 30.00	Now	24.50
World History (Cass)	$ 30.00	Now	24.50
Basic Algebra (Cass)	$ 30.00	Now	24.50
TeleLink (Rom)	$ 25.00	Now	20.50
Music Composer (Rom)	$ 60.00	Now	48.50

EDU-WARE

Compu-Read (Disk)	$ 29.95	Now	24.50
Compu-Math Fractions (Disk)	$ 39.95	Now	32.50
Compu-Math Fractions (Cass)	$ 29.95	Now	24.50
Compu-Math Decimals (Disk)	$ 39.95	Now	32.50
Compu-Math Decimals (Cass)	$ 29.95	Now	24.50

LJK SOFTWARE

Letter Perfect (Disk)	$149.95	Now	124.50

ON-LINE SYSTEMS

Wizzard Princess (Disk)	$ 32.95	Now	26.50
Jawbreaker (Disk)	$ 29.95	Now	24.50
Soft Porn Adventure (Disk)	$ 29.95	Now	24.50

PERSONAL SOFTWARE

Visacalc (Disk)	$199.95	Now	162.50
Checker King (Cass)	$ 19.95	Now	16.50
Microchess (Cass)	$ 19.95	Now	16.50

QUALITY SOFTWARE

Fastgammon (Cass)	$ 19.95	Now	16.50
Name That Tune (Disk)	$ 17.95	Now	14.50
Name That Tune (Cass)	$ 14.95	Now	12.50
Starbase Hyperion (Disk)	$ 22.95	Now	18.50
Starbase Hyperion (Cass)	$ 19.95	Now	16.50

★ SEND FOR FREE
PRICE LIST & CATALOG ★

DEDUCT 3% IF PAYMENT ACCOMPANIES **ORDER.** INCLUDE $2.00 FOR SHIPPING AND HANDLING. IF YOU PHONE ORDER WE WILL CREDIT **$1.00 FOR CALL.** CALIFORNIA RESIDENTS ADD 6% SALES TAX. ALL ORDERS SHIPPED FROM STOCK WITHIN 48 HOURS. WE ACCEPT **MASTERCARD AND VISA.** C.O.D.'S ADD $5.00

★ 518 E. ECHO CT.,
SAN BERNARDINO, CA 92404
PHONE ORDERS (714) 886-0761

CIRCLE 309 ON READER SERVICE CARD

Scotch Diskettes

Rely on Scotch® diskettes to keep your valuable data safe. Dependable Scotch diskettes are tested and guaranteed error-free. The low abrasivity saves your read/write heads. They're compatible with most diskette drives.

Scotch
3M
diskettes
Scotch
3M
diskettes

(800)235-4137

VISA

Dealer Inquiries
Invited

PACIFIC
EXCHANGES
100 Foothill Blvd
San Luis Obispo, CA
93401 In Cal call
(800)592-5935 or
(805)543-1037

CIRCLE 169 ON READER SERVICE CARD

TRS-80® DISCOUNT

1-800-841-0860 TOLL FREE

MICRO MANAGEMENT
SYSTEMS INC.
DEPT. NO. 3
Downtown Plaza Shopping Center
115C Second Ave. S.W.
Cairo, Georgia 31728
912-377-7120 Ga. Phone No.

Write For Free Catalog

CIRCLE 163 ON READER SERVICE CARD

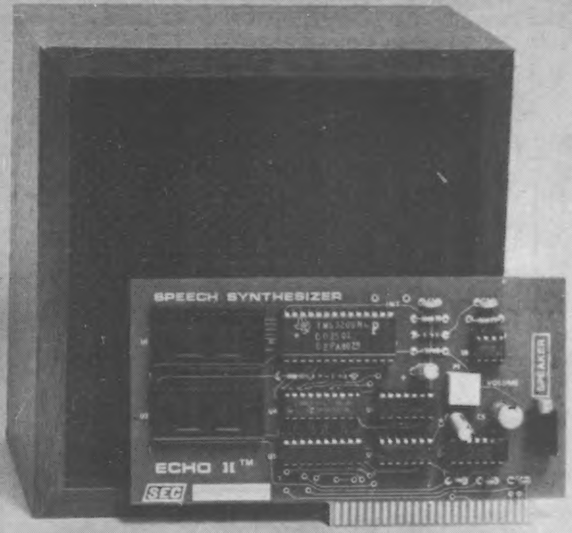
ECHO SERIES™ *SPEECH SYNTHESIZERS*

COMPUTERS ARE SPEAKING OUT!

Now you can add intelligible speech to your computer without using vast amounts of memory! The ECHO][™ speech synthesizer for the Apple* is the first of a series of synthesizers based on the same technology that made the Speak & Spell** a success.

The initial operating system allows the creation of your own vocabulary with phonemes (word sounds) while using very little RAM memory (approx. 800 bytes + 20 bytes/word). Enhanced operating systems and vocabulary ROMs will be offered as they become available.

The ECHO][™ comes complete with speaker, instruction manual, and a disk containing a speech editor, sample programs, and a sample vocabulary. Suggested list price is $225.



See your dealer or contact:

SEC STREET ELECTRONICS CORPORATION

3152 E. La Palma Ave., Suite C
Anaheim, CA 92806 (714) 632-9950

*Trademark of Apple Computer

**Trademark of Texas Instruments

CIRCLE 268 ON READER SERVICE CARD

---

7 Industry Leaders Offer Their Views

The Future of Personal Computers

How will personal computers change our lives in the future? How will the equipment and its applications evolve in the coming years? What roles will personal computers have in society?

The world's leading authorities on personal computers provided some insightful answers at The Boston Computer Society second annual Forum on the Future of Personal Computers, October 15, 1981.

- **Philip D. Estridge**. Director, Entry Systems Business, International Business Machines, Boca Raton, Florida. Mr. Estridge—the creator of IBM's new personal computer—looked into the near future and "The Next Steps for Personal Computers."

- **H.E. James Finke**. President, Commodore International, Ltd., Norristown, Pennsylvania. Mr. Finke gave his perspective on the explosive growth of microcomputers with "The Mass Market Micro: The Future Ain't What It Used to Be."

- **William H. Gates**. President, Microsoft, Bellevue, Washington. Mr. Gates—the father of microcomputer software—provided an inside look at "Things to Come in Personal Computer Software."

- **A.C. (Mike) Markkula**. President, Apple Computer Inc., Cupertino, California. Mr. Markkula examined forthcoming breakthroughs in personal computer technology in his talk "Making Computers Easier to Use: Trends in the User Interface."

- **Peter Rosenthal**. Marketing Manager, Atari Computer Division, Sunnyvale, California. Mr. Rosenthal offered a vision of "The Home Computer of the Future" and its impact on our homes.

- **Jon Shirley**. Vice President, Radio Shack Computer Merchandising, Fort Worth, Texas. Mr. Shirley explored the business applications of future computers with "Personal Computers in the Office of the Future."

- **Nigel Searle**. Vice President, Sinclair Research Ltd., Cambridge, England. Mr. Searle considered the impact of personal computers on consumers in his talk "The Consumer Marketplace for Future Personal Computers."

Moderated by Jonathan Rotenberg, President, The Boston Computer Society.

All seven presentations along with questions and answers are available on two C-90 tape cassettes (2-1/2 hours) for $25 postpaid. If you would also like to subscribe to *Small Business Computers*, add $12 to your order ($37 total). Or, to subscribe to *Creative Computing*, add $20 ($45 total). Send payment or credit card number and expiration date (Visa, MasterCard, American Express) to the address below or call our toll-free number.

creative computing
39 E. Hanover Avenue
Morris Plains, NJ 07950
Toll-free **800-631-8112**
In NJ 201-540-0445

EDUCATIONAL SOFTWARE
TRS-80, COLOR COMPUTER, PET
& APPLE II

ELEMENTARY	MATH
SCIENCE	HISTORY
GEOGRAPHY	ACCOUNTING
ECONOMICS	BUSINESS ED.
FOREIGN LANG.	COIN INVENTORY
GRAMMAR	FARM RECORDS

Write for FREE Catalogue:

MICRO LEARNINGWARE, Box
2134, N Mankato, MN 56001
(507) 625-2205
VISA & MASTER CARD ACCEPTED

We pay 15% royalty for Educational Programs listed with us.
TRS-80 is a registered trademark of TANDY CORP.
PET is a trademark of COMMODORE BUS. MACHINES.
APPLE is a trademark of APPLE COMPUTER CO.

CIRCLE 185 ON READER SERVICE CARD

IMB **TRS-80*** 16K
COLOR GAME
LIMITED OFFER!

FREE WE'LL SEND YOU OUR BONUS GAME OF THE MONTH WHEN YOU SEND US A SELF-ADDRESSED, STAMPED ENVELOPE FOR OUR FREE, COLOR PROGRAM LIST.

16 K COLOR EXTENDED HI-RESOLUTION GAMES**

STARBASE ATTACK $ 12.95
METEOR STORM $12.95
STAR SIEGE $ 12.95

HIGH SPEED ARCADE GAME
KOSMIC KAMIKAZE $18.95
JOYSTICKS REQ'D

*TRS 80 is a TM of Tandy Corp.

CERTIFIED CHECKS OR MONEY ORDERS ONLY

IMB illustrated memory banks
P.O.BOX 289
WILLIAMSTOWN, MA. 01267-0289

EXPIRES 12-15-81 **CASSETTE

CIRCLE 188 ON READER SERVICE CARD

NEW! for
the '89 from
MAGNOLIA
MICROSYSTEMS

DOUBLE DENSITY
DISK CONTROLLER

for both 5¼" & 8" drives
only $595 complete
including CP/M™2.2

MAGNOLIA MICROSYSTEMS, INC.
2812 Thorndyke W., Seattle 98199
(206) 285-7266 (800) 426-2841

CP/M is a trademark of Digital Research.

CIRCLE 162 ON READER SERVICE CARD

Bonita
COMPUTER SOFTWARE
10% Discount

APPLE	ATARI	TRS 80 L11
Adventure Series #1-11	T, AT, AP	$17.95 Tape
Conflict 2500	T, AT, AP	13.50 Tape
Deathmaze 5000	T, AP	11.65 Tape
Empire of the Overmind	T, AT, AP $31.50 Disk	27.00 Tape
Invaders from Space	T only $18.85 Disk	13.45 Tape
Rescue at Rigel	T, AT, AP	26.95 Tape
Super Script	T only	26.95 Disk
Tawala's Last Redoubt	T $22.45 Disk AP $26.95 Disk	17.95 Tape

Many more games, utilities, business, etc. available
Disk and Cassette

Purchase by M.O., Check (Allow 10 days to clear),
or C.O.D.
Add $1.00 Postage Per Order
(MD Add 5% Sales Tax)
For price sheet, write to:

Bonita
Computer Software
P.O. BOX 59612, WALTER REED STATION
WASHINGTON, D.C. 20012

CIRCLE 176 ON READER SERVICE CARD

Verbatim
flexible disks

Call Free **(800) 235-4137** for prices and information. Dealer inquiries invited. C.O.D. and charge cards accepted.

VISA

PACIFIC EXCHANGES
100 Foothill Blvd.
San Luis Obispo, CA
93401. In Cal. call
(800) 592-5935 or
(805) 543-1037.

CIRCLE 169 ON READER SERVICE CARD

"Attention Computer Owners"
If you own a mini or micro...you could be on your way to fantastic riches. Put your computer to a new use by monitoring these investments. Set up your own office in your home...never work for the other guy again. It is the most ingenious method ever devised. Make six digits annually.
First time offered. Complete package-$25.00. We pay postage & handling. Send check or M.O. to:
C.B.A.S.
P.O. Box 163
Ontario, OH 44862

CIRCLE 203 ON READER SERVICE CARD

SAVE
$150.00 for a 4-MHz Z80A system with 64-KB of memory plus a real front panel
OR
$200.00 for a 24x80 full function CRT!! you can roll your own technology, save a bundle and be running BASIC, FORTRAN, COBOL on your own computer system before you know it! *F R E E D E T A I L S !*
DIGATEK CORP., 2723 West Butler Drive,
Suite 30, Phoenix AZ 85021

CIRCLE 145 ON READER SERVICE CARD

REAL ESTATE SOFTWARE
for Apple—TRS-80—PET

• PROPERTY MANAGEMENT SYSTEMS $325

- Tenant History
- Late Rent Report
- Vacancy Report
- Income Report
- Auto Late Change
- Returned Checks
- Ownership Files
- Building Reports
- Utilities Report
- Tax Expense Report
- Prints Checks
- Prints Receipts

• PROPERTY LISTINGS COMPARABLES $325

SCREEN BY
- 22 Items Listed
- 4000 Listing Disk
- Listing Memo Field
- Max. Min. Price
- Units Zone City
- Max. Price Income
- Max. Price Sq. Foot
- Min. Cashflow

• REAL ESTATE ANALYSIS MODULES $40 MOD

- Home Purchase
- Income Property Analysis
- Property Sales
- Construction Cost
- Word Processor
- Tax Deferred Exchange
- APR Loan Analysis
- Loan Amortization
- Depreciation Analysis

Magic Wand $285

RS Software Realty Company™

at computer stores everywhere
or order COD direct
(CA residents add 6% sales tax)
(213-372-9419)

Dept. C, 1116 8th St., Manhattan Beach, CA 90266

CIRCLE 325 ON READER SERVICE CARD

RAM
For ATARI

Get the most from your ATARI 400. Memory expansion to a full 48K is now possible with our 48K Board. Expand your ATARI 800 with our 32K Board.

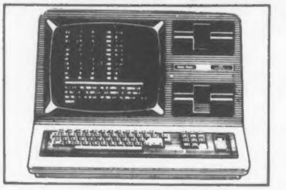
48K Board $299
32K Board $199

INTEC
Suite # 111
3387 Del Rosa Ave. North
San Bernardino, CA 92404
(714) 864-5269

CA residents add 6 percent tax
ATARI is trademark of ATARI, Inc.

CIRCLE 284 ON READER SERVICE CARD

Save On
TRS-80™ Computers



For the best deals on TRS-80 Computers, we have **SPECIAL DISCOUNTS, FREE SHIPPING** and a **TOLL FREE ORDER NUMBER**

Pan American
Electronics
Dept. 22 • 1117 Conway • Mission, TX 78572
Telex Number 767339
Toll Free Order Number 800/531-7466
Texas & Principal Number 512/581-2766
TM - Trademark of Tandy Corporation

CIRCLE 186 ON READER SERVICE CARD

...retail roster...

CALIFORNIA

Advance Data Concepts—2280 Diamond Blvd., Concord 94520; (415) 671-9016. 9-5 Mon.-Fri. Vector-Graphic, CP/M Software Headquarters-User's Group.

D.E.S. Data Equipment Supply—8315 Firestone, Downey 90241. (213) 923-9361. 7 days. Commodore PET specialists. Hardware, Software, Books, Mags, Supplies, In House Maintenance.

CONNECTICUT

Computerworks—1439 Post Rd., East Westport 06880; (203) 255-9096. 12-6 Tues.-Fri., 12-9 Thu., 10-5 Sat.

GEORGIA

Atlanta Computer Mart—5091 Buford Hwy., Atlanta 30340; (404) 455-0647. 10-6 Mon.-Sat.

ILLINOIS

Computer Land/Downers Grove—136 Ogden Ave., Downers Plaza 60515; (312) 964-7762. 10-6 Mon.-Sat., 10-8 Tue., Thurs. Apple, Atari, Osborne xerox, Vector.

Data Domain of Schaumburg—1612 E. Algonquin Rd., Schaumburg 60195; (312) 397-8700. 12-9 Tues.-Fri., 11-5 Sat. Apple, Alpha Micro, Hewlett-Packard Calculators. Largest book and magazine selection.

Farnsworth Computer Center—1891 N. Farnsworth Ave., Aurora 60505; (312) 851-3888. 10-8 Mon.-Fri., 10-5 Sat. Apple, Hewlett-Packard series 80 systems, HP Calculators, IDS Printers.

Gavin Computers—5935 W. Addison St., Chicago 60634; (312) 286-4232. Mon.-Thurs. 9-8:30, Tues.-Sat. 9-6. Apple B & H, Atari & Commodore Systems.

Lilllpute Computer Mart, Inc.—4446 Oakton, Skokie 60076; (312) 674-1383. M-F 10:30-8pm, Sat. 10-6. We sell Cromemco, Gimix, Bell & Howell, North Star and others. Starting our fifth year in business.

Video Etc.—465 Lake Cook Plaza, Deerfield 60015; (312) 498-9669; Open Every day. Strong software support for Apple, Atari.

The Video Station—872 So. Milwaukee Ave., Libertyville 60048; (312) 367-8660. Open 7 days. Atari Computers, Hardware and Software.

MASSACHUSETTS

Neeco—679 Highland Ave., Needham 02194; (617) 449-1760. 9-5:30 Mon.-Fri. Commodore, Apple, Superbrain, Atari.

Science Fantasy Bookstore—18 Eliot St., Harvard Sq., Cambridge 02138; (617) 547-5917. 11-5 Mon.-Sat., 11-8 Thur. Apple & TRS-80 games; Epyx, Microsoft, Creative Computing.

MICHIGAN

Computer Center—Garden City; (313) 425-2470 & West Bloomfield; (313) 855-4220; Books, Magazines, Hardware and Software for Apple, North Star, TRS-80 & PET.

NEVADA

Home Computers—1775 E. Tropicana #6, Las Vegas 89109 (702) 798-1022. 10-7 Mon.-Sat. Apple, Commodore, Atari, AIM 65, (Books) Sales & Service.

NEW JERSEY

Computernook—Rt. 46, Pine Brook Plaza, Pine Brook 07058; (201) 575-9468. 10-6:30 MTWS, 10-8 Thurs., Fri. Apple/Commodore Authorized dealer.

The Computer Universe—155 Route 17S., Paramus 07652; (201)262-0960—347-9006. Mon; Wed; Fri., and Sat., 10-6. · Tues., and Thurs; 12-9. Specializing in Apple Computers.

Silent Partner—2050 Center Ave., Fort Lee 07024; (201) 947-9400; Mon.-Sat. 10-6. Apple/Atari/Commodore/Vector/Malibu.

Software Mart—352 Bloomfield Ave., Caldwell 07006; (201) 228-4949. Software for Apple, Atari, TRS-80 and PET always 10-20% off list.

Software City—Pine Brook, 101 Rt. 46 East, 07058; (201)575-4574. Bus/Rec Utility/Home Programs for TRS-80, Atari, Apple and IBM. Up to 20% off list.

Software City—111 Grand Ave., River Edge 07661; (201) 342-8788. Bus./Rec./Utility Home programs for TRS-80, Atari, Apple and IBM up to 20% off list.

Stonehenge Computer Shop—89 Summit Avenue, Summit 07901; (201) 277-1020. 10 am-6:30 pm Mon.-Sat. Apple/Bell & Howell/Commodore Authorized Dealer, Sales and Service.

NEW YORK

The Computer Center—31 East 31st St., New York 10016; (212) 889-8130. 10-7 Mon.-Fri., 11-6 Sat., 10-8 Thur.

Upstate Computer Shop—629 French Rd., Campus Plaza, New Hartford 13413; (315) 733-9139. 10-6 Mon.-Fri., 11-5 Sat. Apple—Commodore—Data General.

OHIO

Abacus II—1417 Bernath Pkwy., Toledo 43615; (419) 865-1009. 10-6, 10-7 Thurs. Apple, Osborne, Adds, NEC, Atari, Epson & IDS Printers.

Barnhart Stores—612 N Main St; (513)653-7257. 8am-5pm. Atari Computers at MAIL ORDERS prices/ Authorized Atari Service Center.

Micro Mini Computer World—74 Robinwood Ave., Columbus 43213; (614) 235-5813/6058. 11-7 Tues.-Sat. Authorized Apple/Commodore dealer. Sales, Service, Business Software.

North Coast Computers—626 Dover Center, Bay Village 44140; (216) 835-4345. 10-6 Mon.-Sat., 10-8 Tue., Thur. Apple/Atari/Vector Graphic/Data General.

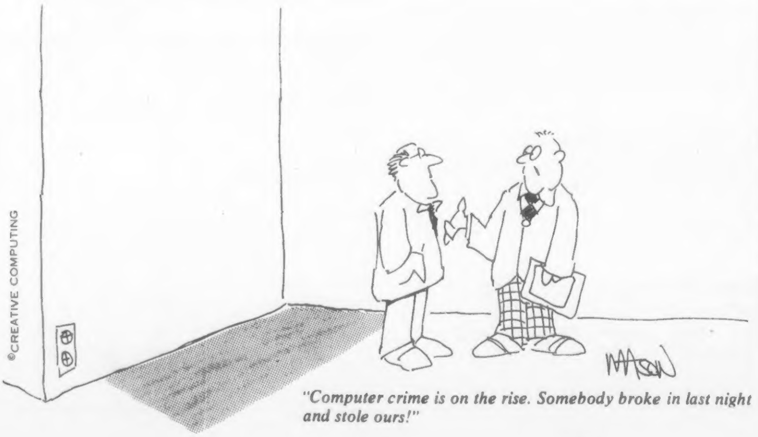
WISCONSIN

Petted—4265 W. Loom's Rd., (I-894-Hwy. 36, Milwaukee 53221; (414) 282-4181. 12-8 Mon.-Fri., 10-4 Sat. Authorized Commodore PET, CBM, VIC dealer. Books, Magazines, Chips, etc.

To include your store in Creative Computing's *Retail Roster, call the Advertising Department at (201) 540-9168.*

• index to advertisers •

Reader Service	Advertiser	Page
102	Aardvark Technical Services	109
105	ABM Products	213
106	Accent Software	43
103	Adwar Video	58
*	ALF Products	147
112	Allenbach Industries	90
159	Alpha Byte Stores	127
170	Alpha Byte Stores	88,89
114	Alpha Supply Co.	163
101	Amber Software	83
113	Amber Software	163
117	Apple Computer Corp.	8,9
121	Applied Analytic Inc.	162
109	ASAP Computer Products Inc.	111
116	Aspen Software	107
118	Atari	24,25
107	Aurora Systems	57
110	Automated Simulations	7
160	Beagle Brothers Micro Software	160
164	Big Five Software	2
115	The Bit Bucket	105
176	Bonita Computer Software	222
322	Broderbund Software	31
264	Broderbund Software	43
129	Broderbund Software	105
125	Bytes & Pieces	115
203	CBAS	222
119	Central Point Software	134
133	Charles Mann & Associates	169
111	Cload Magazine	114
126	Comm Data Systems	199
120	Commodore Business Machines	Cover 2
198	Communications Electronics	119
123	Computer Age	135
108	Computers by Mail	212
141	Computer Exchange	113
122	Computer Information Exchange	212
148	Computer Mail Order	197
124	Computer Plus	216
222	Computer Products International	198
127	Computer Services Corp.	5
128	Computer Shopper	199
134	Computer Specialties	193
*	Computer Tutor	143
132	Computerville	175
130	Computer Wholesale	188
137	Computronics	149
138	Computronics	151
135	Concord Computer Components	200
140	Consumer Computers Mail Order	121
161	Cottage Software	216
248	Countryside Data	143
171	CPU Shop	155
139	Creative Software	195
143	Cybertext Corporation	83
256	Data Resource Corp.	205
266	Data Soft	123
150	Designer Software	15
145	Digatek Corporation	222
173	Digibyte Systems	59
146	Digi-key Corporation	189
158	Discount Data Products	133
131	Discount Software Group	219
343	DJ "AI" Systems	183
136	Dynacomp	116,117
154	Ecosoft	153
142	Electronic Specialists	169
177	Exidy Systems	35
178	Frederick Computer Products	185
*	Heath Co.	65
257	H & H Trading	169
183	Horizon Simulations	125
190	Howard Industries	99
144	Huntington Computing	101
*	H.W. Electronics	201
208	IBM	1
147	IDSI	81
188	IMB	222
280	Infocom	27
149	Inmac	169
284	Intec	222
151	Interpretive Education	160
199	Jade Computer	139-141
197	Jenson Tools	125
291	Kleinhammer Business Software	165
293	Kleinhammer Business Software	187
294	Konan Corporation	87
219	Krell Software	39
295	Lazer Micro Systems	217
182	Leading Edge	Cover 4
206	L.I. Computer General Store	187
278	LNW Research	51
162	Magnolia Microsystems	222
207	Mannfred Electronics	187
152	Mark of the Unicorn	13
306	Micro Business World	95
195	Micro Distributors	213
185	Micro Learningware	222
210	Micro Mail	175
308	Micro Mountain	161
309	Micro Mountain	220
189	Micro Power & Light	199
172	Microsoft	23
247	Microsystems	211
224	Micro Technology Unlimited	63
342	Microtek	173
212	Microworks	203
313	Mumford Microsystems	215
314	Muse Software	40
226	Muse Software	128
285	Neeco	129
196	Net Profit Computers	165
153	Northern Technology Books	93
*	NRI Schools/Electronics Division	97
155	Omega Micro	216
201	Omega Microware	171
200	Omega Microware	185
202	Omega Microware	90
213	Omega Sales	54,55
191	Omnitec Data	205
250	Orange Micro	76,77
315	Osborne/ McGraw Hill	85
169	Pacific Exchanges	105
169	Pacific Exchanges	216
169	Pacific Exchanges	220
169	Pacific Exchanges	222
186	Pan American Electronics	222
292	Pegasys Systems	90
239	Peripherals Plus	29
239	Peripherals Plus	191
239	Peripherals Plus	208
239	Peripherals Plus	214
157	Personal Computer System	102
235	Perry Oil & Gas	195
251	Professional Software	32
*	Professional Software	69
165	Programmers Institute	195
282	Prometheus Products Inc.	21
194	Quality Software	71
205	Racet Computes	181
*	Rainbow Computing	131
325	Realty Software	222
166	Restaurant Publishing Co.	218
*	Retail Roster	223
326	R.H. Electronics	57
327	R.H. Electronics	201
303	River Bank Software	201
156	Scelbi Publications	160
330	Service Technology	179
*	Sinclair Research Ltd.	16,17
238	Sirius Software	72,73
332	Sir-tech	74
234	Software Street	203
167	Software Toolworks	216
271	Spectral Associates	36
*	Spectrum Software	137
334	SRA	163
290	Small Business Computers	167
233	The Stocking Source	96
245	Strategic Simulations	79
268	Street Electronics Corp.	221
187	Sublogic	147
184	Supersketch	211
174	Supersoft	179
175	Supersoft	205
215	Sync	19
277	Systems Plus	11
192	System Software	217
193	Total Information Service	134
181	Trans Net Corporation	199
338	Vital Information	66
340	VR Data	49
179	Wesper Micro	Cover3
180	Western Digital	215
283	York 10 Computerware	211



"Computer crime is on the rise. Somebody broke in last night and stole ours!"

Creative Computing

300	Apple Software	61
300	Apple Software	207
300	Atari Software	45
350	Basic Computer Games	213
350	Blister Ball/Torax	33
350	Cassette Software Sale	209
350	Colossal Computer Cartoon Book	144
350	Computers for Kids	47
350	Computers in Mathematics	158
350	Future of Personal Computers	221
300	Games Software	211
350	Getting Acquainted with your VIC	206
350	Katie and the Computer	218
300	Making the most of your TRS-80 Color Computer	208
300	Milestones	206
300	Plotter/ Curve Fitter	208
350	Problems for Computer Solution	158
350	Stock and Options Analysis	206
*	Subscriptions	145
300	TRS-80 Software	177
300	Trucker and Streets of the City	53

*Write advertiser directly.

Wizard-80™

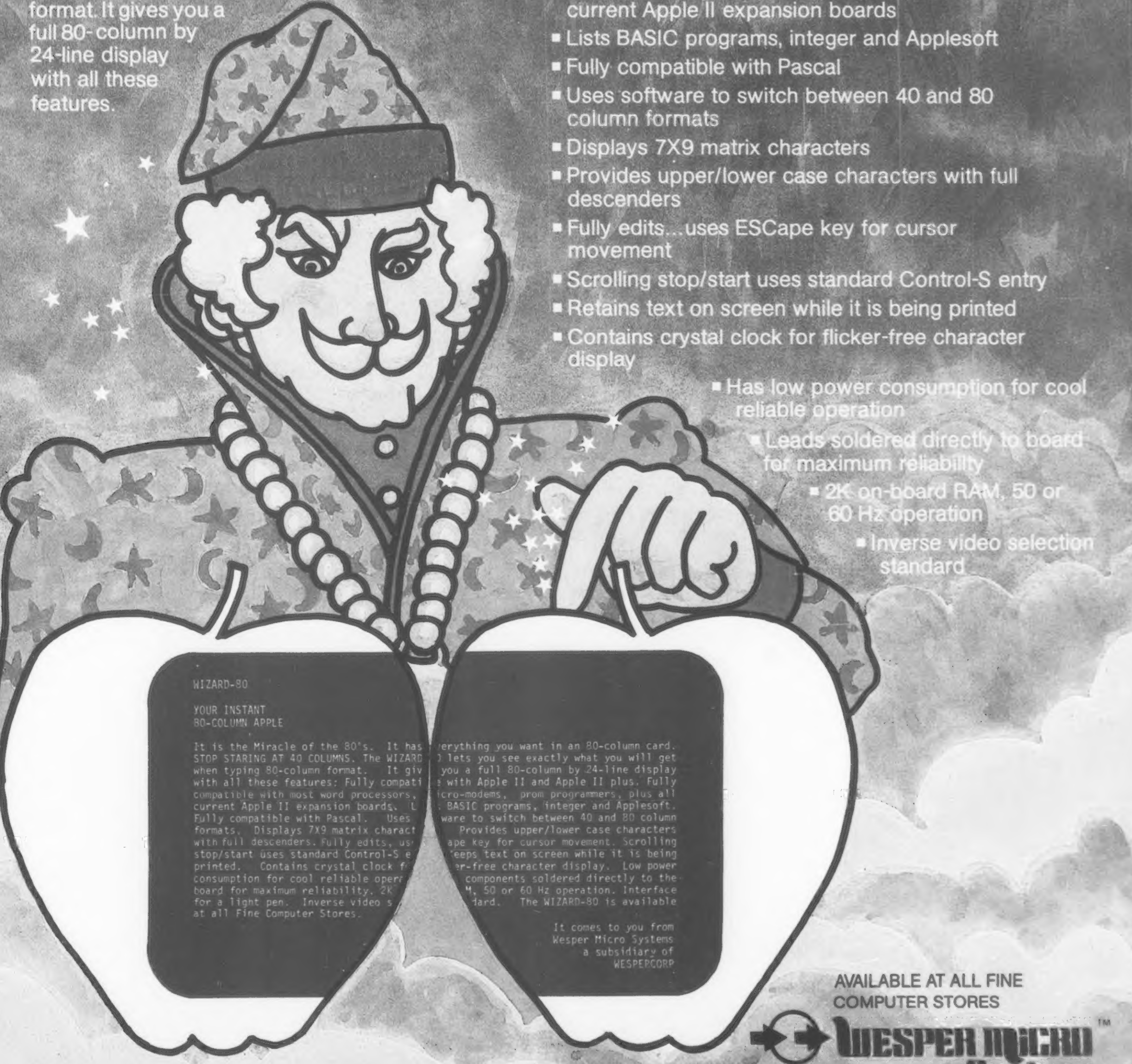
INSTANT 80 COLUMN APPLE*

The miracle of the 80's...everything you want in an 80-column card.

STOP STARING AT 40 COLUMNS

WIZARD-80 lets you see exactly what you will get when typing 80-column format. It gives you a full 80-column by 24-line display with all these features.

- Fully compatible with Apple II® and Apple II Plus®*
- Fully compatible with most word processors, micro-modems and prom programmers, plus all current Apple II expansion boards
- Lists BASIC programs, integer and Applesoft
- Fully compatible with Pascal
- Uses software to switch between 40 and 80 column formats
- Displays 7X9 matrix characters
- Provides upper/lower case characters with full descenders
- Fully edits...uses ESCape key for cursor movement
- Scrolling stop/start uses standard Control-S entry
- Retains text on screen while it is being printed
- Contains crystal clock for flicker-free character display
- Has low power consumption for cool reliable operation
- Leads soldered directly to board for maximum reliability
- 2K on-board RAM, 50 or 60 Hz operation
- Inverse video selection standard



```
WIZARD-80

YOUR INSTANT
80-COLUMN APPLE

It is the Miracle of the 80's.  It has  erything you want in an 80-column card.
STOP STARING AT 40 COLUMNS. The WIZARD  ) lets you see exactly what you will get
when typing 80-column format.   It giv   you a full 80-column by 24-line display
with all these features: Fully compati  e with Apple II and Apple II plus. Fully
compatible with most word processors,   icro-modems,  prom programmers, plus all
current Apple II expansion boards.  L   BASIC programs, integer and Applesoft.
Fully compatible with Pascal.   Uses    ware to switch between 40 and 80 column
formats.  Displays 7X9 matrix charact      Provides upper/lower case characters
with full descenders. Fully edits, us     ape key for cursor movement. Scrolling
stop/start uses standard Control-S e     eeps text on screen while it is being
printed.   Contains crystal clock f      er-free character display.  Low power
consumption for cool reliable oper         components soldered directly to the
board for maximum reliability. 2K          M, 50 or 60 Hz operation. Interface
for a light pen.  Inverse video s         dard.   The WIZARD-80 is available
at all Fine Computer Stores.

                                                       It comes to you from
                                                       Wesper Micro Systems
                                                           a subsidiary of
                                                                WESPERCORP
```

AVAILABLE AT ALL FINE
COMPUTER STORES

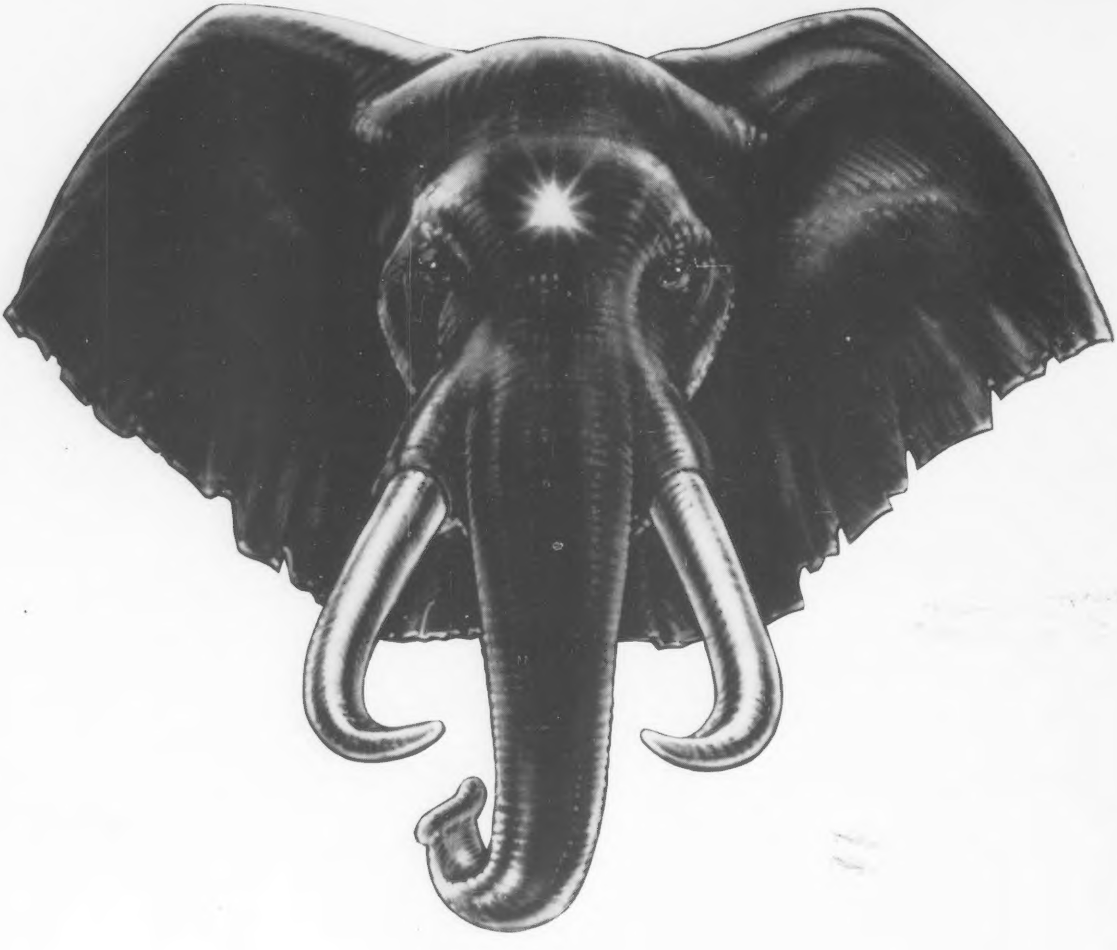
WESPER MICRO Systems™

SUBSIDIARY OF WESPERCORP
14321 New Myford Road
Tustin, California 92680

*Registered trademarks of Apple Computer Inc.

CIRCLE 179 ON READER SERVICE CARD

REMEMBER.



Leading Edge Products, Inc., 225 Turnpike Street, Canton, Massachusetts 02021
Toll-free: 1-800-343-6833; in Massachusetts (617) 828-8150. Telex 951-624.

CIRCLE 182 ON READER SERVICE CARD